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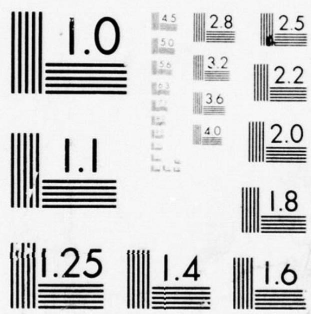

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COMBAT-II USER'S GUIDE

The BDM Corporation
7915 Jones Branch Drive
McLean, Virginia 22101

30 June 1977

Final Report for Period 1 August 1976—30 June 1977

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The COMBAT-II model is a highly aggregated, expected value model of combat at the theater level featuring both air and ground interactions in conventional and nuclear environments. Forces interact on three fronts. Multiple artillery systems, missile systems, supply and munitions flows, and aircraft are represented.

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PREFACE

Development of the COMBAT-II model was sponsored by the Defense Nuclear Agency, Washington, D.C. 20305 under Contract No. DNA001-76-C-0067. The United States Government is authorized to reproduce and distribute reprints for Governmental purposes notwithstanding any copyrights notation. The program monitor was Captain Jerome Bruni.

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INTRODUCTION TO
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A. INTRODUCTION

Assessment of military capability is very much an art requiring careful judgments by seasoned military and civilian professionals. These judgments can never be supplanted. They can, however, be greatly facilitated and improved through the availability of selected quantitative measures and assessments. The discipline of developing mathematical descriptions of physical processes is referred to as modeling. If properly used, quantitative models can be useful adjuncts to defense decision making.

In fact, as issues become more complex and as the number of individuals involved in the decision process increases, it becomes ever more necessary to tie the dialogue into a logical structure and format. The utility of models in meeting this need depends directly on the extent to which they can provide insights into the problem, and the understanding that analysts and users have of the role mathematical models may play in decision making.

The purpose of this chapter is to provide the potential user a summarization of the operation, strengths, limitations, and computer software characteristics of the COMBAT-II model.

B. MODEL OVERVIEWS

COMBAT-II is a computerized model portraying two-sided simultaneous air and ground combat at the theater level. The model has the capability of portraying conventional nuclear, or mixed combat interations. It may be characterized as an aggregated, quick running, expected value model providing insights into the effects of alternative resource allocation policies.

The model provides an option for the modification of both combat variables, such as probabilities of kill, and operational variables, such as

scaling factors, at user selected times during the simulated conflict. In addition, a number of output options are available providing both graphical and tabular displays of the conflict results.

The COMBAT-II model was developed for the Defense Nuclear Agency. It has evolved into two versions, one of which focuses on airborne weapon systems and the other of which focuses on artillery weapon systems.

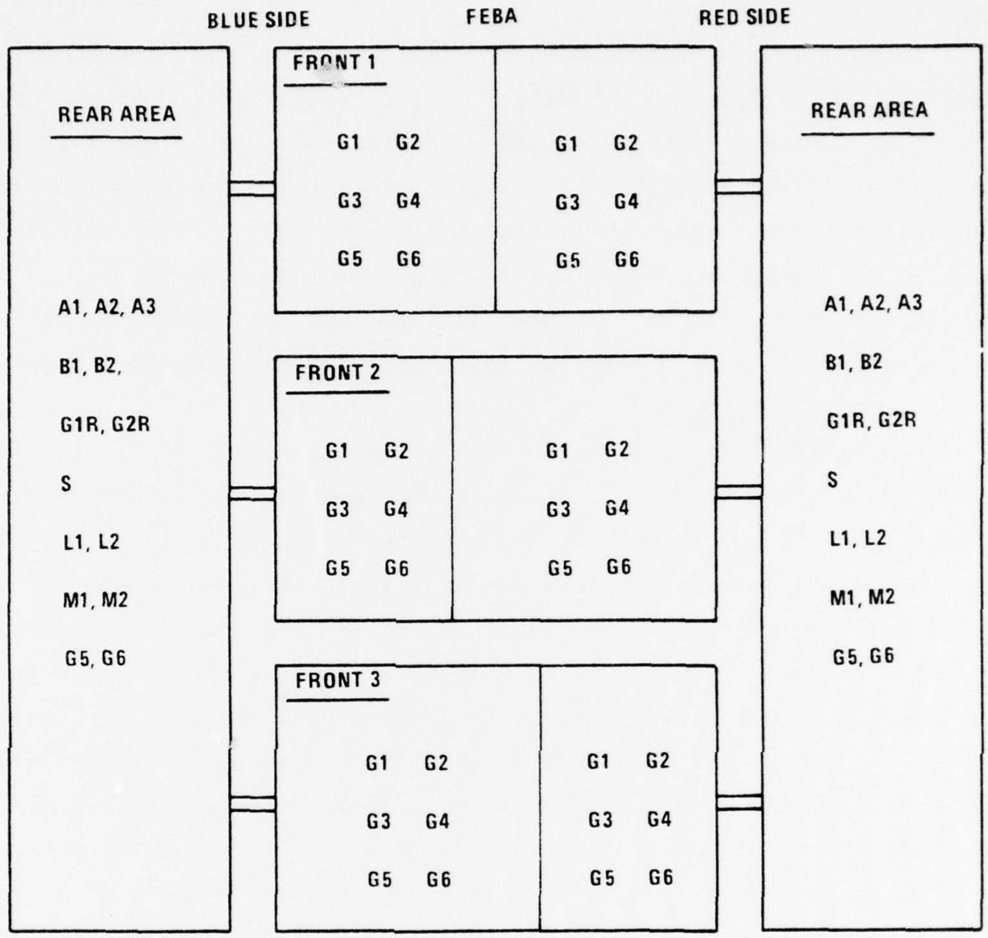
C. FUNCTIONAL DESCRIPTION

1. Overview of the Model Characteristics

As shown in Figure I-1, the COMBAT-II model portrays three fronts and a rear area for each of two opposing sides, referred to as RED and BLUE. Frontal entities include ground force packets, supply packtes, artillery and their associated munitions, and frontal surface-to-surface missiles and their associated warheads. The combat capabilities of a ground force packet are modeled as a single value reflecting the overall combat effectiveness of the packet. This "notional" value is derived for a representative unit of each side and applied to all ground force packets of that side. The size of each packet is considered to be a battalion for NATO forces and a regiment for Warsaw Pact (PACT) forces. The movement of the FEBA is based on the relative combat effectiveness of opposing units within their respective forces.

Such impediments to movement as weather and terrain are not explicitly modeled. Their effects may be treated implicitly through variation, by the user, of unit movement rates. Interaction between frontal forces and weapon systems takes place only within the front to which those forces have been allocated. Forces may, however, be withdrawn to the rear area for reallocation to other fronts.

Rear area entities include ground force reserve packets, rear supply packets, nuclear storage sites, artillery rounds and frontal missile warheads, and two types of centrally controlled surface-to-surface missile launchers and their warheads. Ground forces, supply packets, nuclear munitions, and missiles may be allocated from the rear area to any of the three fronts on the basis of demands generated by the conflict activities occurring at those fronts.



REAR AREAS

- A1, A2, A3 – 3 TYPE AIRCRAFT
- B1, B2 – 2 TYPE AIRBASES
- G1R, G2R – RESERVE GROUND FORCES AND SUPPLIES
- S – NUCLEAR STORAGE SITES
- L1, L2 – NUCLEAR MISSILE LAUNCHERS
- M1, M2 – NUCLEAR MISSILE WARHEADS
- G5, G6 – ARTILLERY ROUNDS AND FRONTAL MISSILE WARHEADS

FRONTS

- G1 – GROUND FORCES
- G2 – SUPPLIES
- G3 – ARTILLERY TUBES
- G4 – SSM LAUNCHERS
- G5 – ARTILLERY ROUNDS
- G6 – NUCLEAR SSM WARHEADS

Figure I-1. Entities Modeled in COMBAT-II

As shown in Figure 1-2, two types of air bases, launching aircraft of three types, are modeled. All aircraft carry notional loads by munition type and side and may be allocated to either close air support, counter air, or interdiction. Differentiations between aircraft strike capabilities are absorbed in the probabilities of kill. All aircraft engage in air combat, with the survivors either returning to base or entering the ground support or interdictive roles. Aircraft may be assigned to any role, but only two types of aircraft are nuclear capable.

2. Model Versions

The COMBAT-II model exists as a single program containing both the air and artillery version. Each version requires different inputs, operates in a different fashion, and produces different outputs.

The major modeling differences between the air and artillery versions lie in their means of treating aircraft sorties, in the number of frontal weapons systems modeled, in the means of nuclear delivery, and in the frontal weapon systems targeting mechanisms.

In the air version, the aircraft to air base allocations are treated as specific numbers. This means that if fifty aircraft are intially assigned to a particular base and thirty of those aircraft are lost on sorties, then twenty aircraft will return and be available at that base. The artillery version, on the other hand, treats the allocation of aircraft to air bases as a percentage of the total aircraft within the theater. If 50% of the aircraft are initially assigned to the forward bases and 50% to the long range bases and thirty aircraft are lost out of a total of fifty sorties launched by both types of bases, then ten of the surviving aircraft will return to each of the base types.

The artillery version provides three more frontal weapon systems than the air version. In addition, the direct targeting of frontal weapon systems is possible in the artillery version, but not in the air version.

The most significant difference between the two models is the nuclear delivery mechanism provided. The air version permits a mixture of nuclear and conventional aircraft sorties to occur simultaneously. The

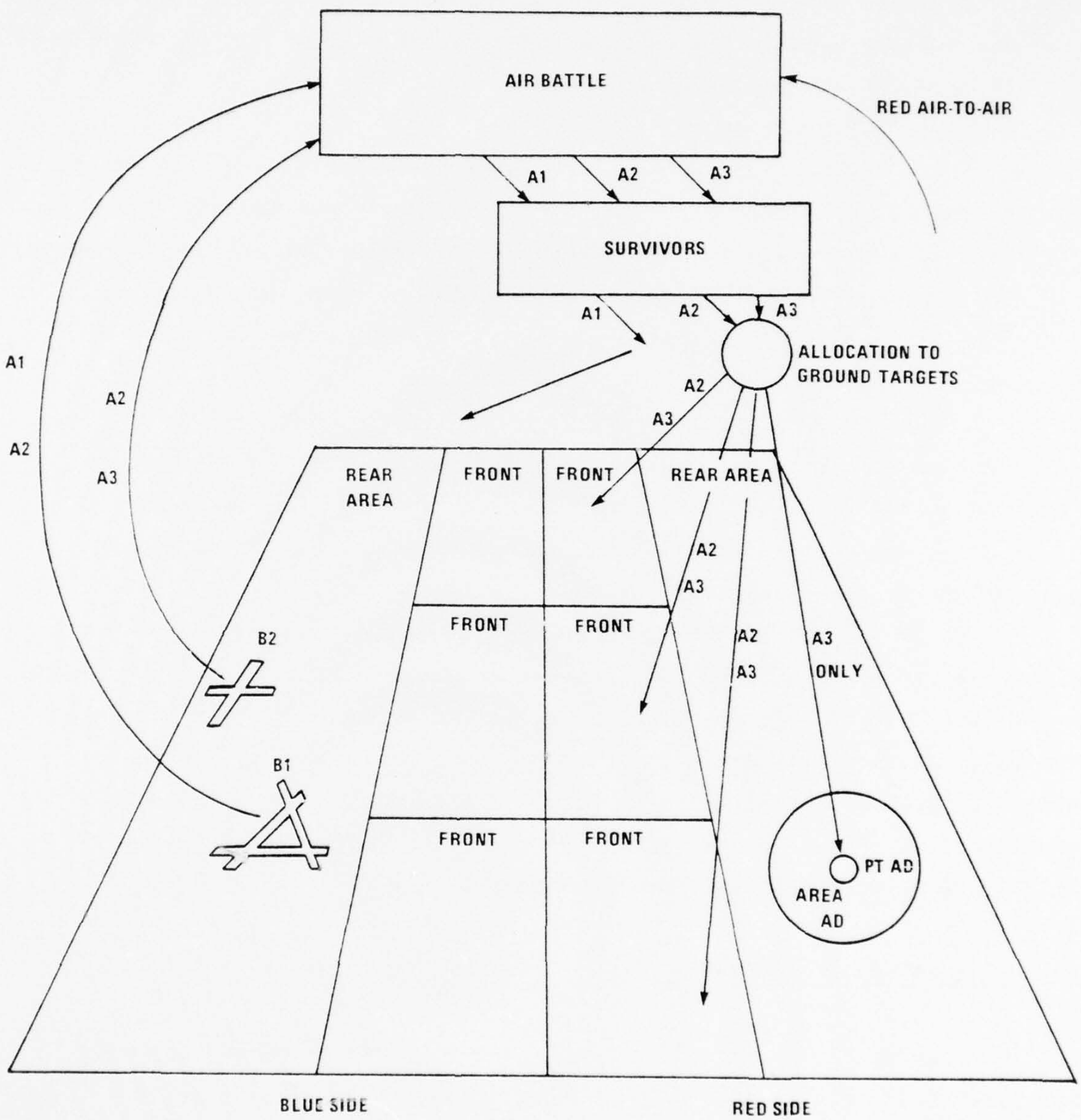


Figure 1-2. Diagramatic Representation of Air Combat

artillery version, on the other hand, does not permit the mixing of nuclear and conventional aircraft munitions. In the artillery version, all aircraft that are nuclear capable may carry either conventional or nuclear munitions, but not both, at any one point in time.

3. Model Operations

The interactions between various modeled entities are represented through the integration, over time, of approximately one hundred ordinary differential equations. Time histories are maintained detailing the numbers and relative locations of units, targets killed by type, condition and status of the supply flows, deployments, and attritions due to enemy source by type.

The COMBAT-II model utilizes a highly efficient self correcting integration algorithm that achieves simulation time discriminations of less than one hour. This very fine time discrimination is necessary to resolve the rapid changes that take place in combat unit states during the nuclear release phases of a conflict.

The primary set of equations upon which attiritions, both nuclear and conventional, are based is a Lanchester Square Law formulation. Enhancements to the formulation have been made to represent such effects as the attrition caused by indirect fire from conventional and nuclear weapon systems. Both RED and BLUE calculations are performed using the same equations, with variations between the characteristics of the two sides introduced through the user input variable values.

D. UTILIZATION OF COMBAT-II

For any model, there exists both a right way and a number of wrong ways to utilize the model. COMBAT-II was designed to examine certain specific elements and processes involved in a combat situation. The model was not designed to predict outcomes in absolute terms but to show the relative effects of various allocation policies over time.

1. Analytic Capabilities of COMBAT-II

(1) The model is designed to provide an overview of the results of theater level mixed combat exchanges. Specifically, the attrition caused and received by each combat system may be analyzed, and theater sensitivities to supply and reinforcement quantities and rates may be identified.

(2) The model may be used to explore the rate of expenditure of high value (including nuclear) systems under differing policies and conditions.

(3) The sensitivity of weapon system attrition to acquisition factors, launch rates, and kill factors may examined.

(4) The sensitivity of the conflict to mobilization times may be determined.

(5) The impact of variations in nuclear release times may be analyzed.

(6) The significance of alterations in target allocation rules and strategies of weapons employment may be studied.

(7) Alternative distributions of stockpiled weapons for both BLUE and RED may be evaluated in terms of the impact on the theater level outcome.

(8) The effects of various MBFR alternatives may be studied.

(9) The relative overall force balance in Europe can be evaluated.

(10) The potential payoffs of new or proposed systems may be examined to determine what weapons characteristics will have a significant effect on the conflict outcome.

(11) The impacts of various tactical air bed-down and dispersion locations may be assessed.

2. Analytic Limitations of COMBAT-II

(1) The worst mistake that could be made in using COMBAT-II would be to interpret the results as precisely accurate predictions. The model indicates relative trends, not point values. In other words, the model must not supplant judgment.

(2) Detailed studies of the logistics net are not possible. The impact of supply stockpiles and flow rates can be assessed, but the details of the physical supply lines are not available.

(3) A comparison of NATO to U.S. capabilities is not practical with COMBAT-II, nor is a differentiation among the various national components of PACT units. This is because such quantities as supply consumption rates and acquisition factors are defined by side on a theater wide basis rather than by front.

(4) The COMBAT-II air version does not permit examination of the attrition contribution of conventional artillery. In addition, only one type of nuclear artillery is modeled explicitly in the air version. A higher resolution of the contribution of nuclear/conventional artillery is, however, available in the COMBAT-II artillery version.

(5) The effects of collateral damage cannot be assessed nor is the amount of collateral damage which occurs calculated in the present version of COMBAT-II.

(6) The effects of delayed casualties on the conflict are not treated and no inferences regarding delayed casualties should be drawn.

(7) The C^3 process is not explicitly modeled, therefore studies of the flow of information cannot be made.

E. SOFTWARE AND OPERATING CONSIDERATIONS

1. Program

COMBAT-II has been partitioned into four major modules. These four modules are of a preprocessor, the simulation model, and two post-processors.

The preprocessor provides a means of documenting the values that are input, and is the vehicle whereby major revisions in the input data base values may be accomplished. It is not essential either for model operation or for output development after the initial data base has been created.

The model consists of one main routine and twelve subroutines. The model contains the code for both the air and artillery versions of COMBAT-II. The two versions are separate subroutines each with its own input subroutine. The remainder of the subroutines consist of various utility subroutines and the integration subroutine.

The two postprocessors accept a file generated by the model. One postprocessor provides tabular listing of user selected systems over user selected time spans. The tables present groups of values detailing a particular weapon system or force status at a time step.

The second postprocessor provides the user with the capability of plotting user selected variables over time, with as many as fourteen variables shown on a single plot.

The options and input requirements for utilizing the COMBAT-II software are detailed in Chapter IV of this manual.

2. Operating Considerations

The COMBAT-II model requires a maximum of three permanent files to operate. The preprocessor and postprocessor programs require only two permanent files to operate. Specific file naming requirements are discussed in Chapter IV. A line printer, card reader and card punch are also required. The model requires approximately 52K words (decimal) to operate. The preprocessor and postprocessors require somewhat less. The system has been developed on a Control Date Corporation 7600 computer system using the CDC extended FORTRAN (Release 4.5) operating under the SCOPE 2.1 operating system. Normal run times are two CPU minutes or less on the CDC 7600.

CHAPTER II

THEORETICAL BASIS AND CONCEPTUAL STRUCTURE OF COMBAT-II

A. INTRODUCTION

In order for the user to properly apply the COMBAT-II model and interpret its results, an understanding of the material contained in this chapter is essential. This chapter is aimed at explaining the fundamental assumptions made in development of the model, and the key mathematical relationships and formulations which are used by the model to compute attritions, FEBA movements and the like.

B. HEURISTIC FORMULATIONS IN COMBAT-II

The primary purpose of COMBAT-II is to calculate time-dependent attritions of interacting combat systems at the theater level. For tactical missile exchanges, most aircraft interactions, and ground force interactions occurring over a period of a few hours, these attritions may be determined without considering ground unit movements. However, for longer periods of combat and for the examination of supply and reinforcement flows, it is desirable to include a function that specifies the rate of ground force advance as a function of the number and effectiveness of the forces on each side. There is no generally accepted theory that adequately explains movement as a function of the combat elements involved. Consequently, the relationship between movement and forces must be determined in a heuristic fashion. Useful results are obtainable only if the movement equation treats each side symmetrically, and the resultant movement is not taken as an absolute measure of combat effectiveness. This has been done in COMBAT-II. The following heuristic formulations form the basis of force movement calculations in the model.

1. <u>Combat Capability Measures</u>

Let B and R stand, respectively, for the strengths of the opposing BLUE and RED ground forces. These force strengths represent an aggregate assessment of the combat capabilities of the units. Let B and R stand, respectively, for the attrition per hour of the BLUE and RED forces attributable to all causes. A heuristic measure of the relative combat effectiveness of the BLUE and RED forces may be taken to be:

$$\frac{\frac{\triangle R}{R}}{\frac{\triangle R}{R} + \frac{\triangle B}{B}} \quad \text{for BLUE}$$

AND

$$\frac{\frac{\triangle B}{B}}{\frac{\triangle R}{R} + \frac{\triangle B}{B}} \quad \text{for RED}$$

By this measure, a higher relative combat effectiveness represents a higher relative rate of attrition for the opposing force.

The difference in the BLUE and RED effectiveness measures, called the r factor, is given by:

$$r = \frac{\frac{\triangle R}{R} - \frac{\triangle B}{B}}{\frac{\triangle R}{R} + \frac{\triangle B}{B}}$$

As a function of BLUE and RED strengths and attrition rates, r varies from +1 when the situation is highly BLUE favorable, to -1 when the situation is highly RED favorable. The expression for r may be simplified to read:

$$r = \frac{B\triangle R - R\triangle B}{B\triangle R + R\triangle B}$$

It can be shown that the function for r is simple, continuous, has continuous derivatives, varies smoothly between plus and minus 1 and is symmetrical. In this formulation r is consistent with simple Lanchester theory.

In Lanchester theory the attrition rate of either side is taken to be proportional to the numerical strength of the opposing side.* In COMBAT-II, however, there is no simple proportionality between ground force strength and attrition. Attrition may in fact be caused by interactions with enemy artillery or air attack for example, as well as by opposing ground forces. A number of variable values are necessary to calculate the effects of these interactions. Each of the individual elements which contributes to the attrition of a force or system is calculated separately and summed to obtain the total ΔB or ΔR. The model keeps track of these contributions of each individual system over time, so that it is possible to decompose the total attrition rate, and thus to present the contributory effects of each component to the user for examination.

2. FEBA Movement

The equation used to translate the relative combat effectiveness measure, r, into FEBA movement is shown in Figure II-1. This equation has been designed so that as the absolute value of r tends to 1, the attacking force should be advancing at or near the maximum possible rate ($\dot{X}_{max}$). When the relative combat capabilities of the opposing forces are equal, i.e., when $B \ \Delta R = R \ \Delta B$, neither force will be advancing since r will be zero. The FEBA equation was designed to agree at these points. The equation also has the properties that both sides are treated symmetrically and that small values of r produce relatively little movement.

In the FEBA movement equation, there are two factors which influence the actual movement rate, the value of A and the value of $\dot{X}_{max}$ for BLUE and RED.

*This assumption leads to the Lanchester Square law, i.e., $R = \ B$ and $\Delta B = \gamma R$ where α and γ are the constants of proportionality, measures of BLUE and RED effectiveness. The above equation for r is then transformed into square law form:

$$r = \frac{\alpha B^2 - \gamma R^2}{\alpha B^2 + \gamma R^2}$$

FEBA MOVEMENT RATE = $\dot{X}$

$$\dot{X} = \dot{X}_{max} \left[rA + (1 - A)\, r^5 \right]$$

GRAPHIC ILLUSTRATION OF FUNCTION

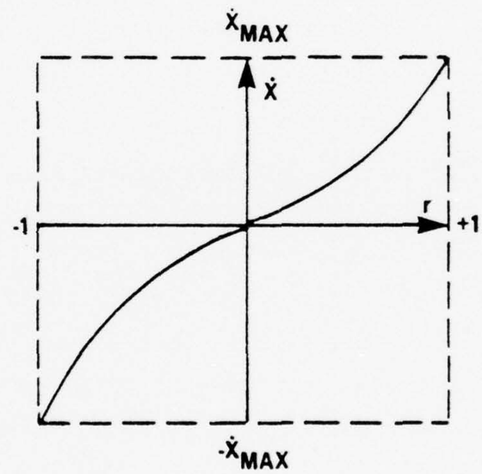


Figure II-1. FEBA Movement Rate Equation

a. The coefficients of r and r^5 determine the shape of the curve. A is called the FEBA Movement Shaping Factor, and is given an input value which provides realistic movement rates given different values of r.

b. The second factor is the value for $\dot{X}_{max}$, the maximum allowable FEBA movement rate. This is an input based on knowledge of the terrain, weather, etc.

One caution should be noted when using the FEBA movement in an analysis. The only case in which the absolute value of r equals 1 is when one side is eliminated or its combat capability becomes zero. At this point B R or R B will be zero and the r equation will reduce to 1 or -1. In a theater level simulation, this situation will normally not occur, but at times r may approach +1 or -1 as limits. When the value of r becomes close to those limits, the FEBA movement results may be inconsistent with the accompanying simulation conditions.

3. <u>Frontal Movement and Demand-Response Relations</u>

The COMBAT-II model simulates three fronts. The FEBA movement within fronts is dependent on the values of r and $\dot{X}_{max}$ for each front. In addition, for each front and side, a fraction of the maximum rate may be set as the command rate for that side in that front. This results in up to six different command designated rates of advance. In each front, the actual movement rate achieved will normally be different from the commanded rate of movement.

For Front 1 the RED and BLUE command rates are user chosen input values. This results from Front 1 always being the sector within which the principal effort is to be made by the attacking side. Fronts 2 and 3 are secondary fronts used to maintain pressure through supporting attacks. Thus, the commanded rates of movement in these fronts are always coupled to Front 1 as some fraction of the command movement rate designated for Front 1.

The command movement rates affect simulation results through the demand equations. They influence the demand for reinforcements and supplies that each frontal commander makes on his rear area. When the attained

FEBA movement rate exceeds the command movement rate, demand can become negative, indicating the commaders's willingness to shift resources to the rear where they are then available to meet the positive demands of other fronts.

Typical demand and response equations are displayed in Figure II-2. In the demand equations there are two limiting factors:

(1) A maximum allowable force density is input as a policy decision or as a result of geographic constraints. Thus, if the commander desires that his forces maintain nuclear density, that policy is implemented in the form of a maximum force density. The model code allows the maximum force density to be changed at any time-step.

(2) A scale factor allows representation of the impact of mobility conditions, e.g., terrain, weather, etc. on resource movement.

Flow equations, which respond to demand, depend on the maximum flow rate, another user input. When demand is positive and large, the flow rate approaches the maximum as long as units are available in the rear. The flow rate is reduced as demand becomes smaller. If demand is negative, units flow from front to rear and become available for commitment to fronts with a positive demand.

Examination of the equations in Figure II-2 shows that the form of the demand-response equations is simple, symmetrical, and scalable. As in the equations for r and $\dot{X}$, each term in the demand-response equations is computed separately and added to obtain total demand or response. The contribution of each component is retained, thereby allowing decomposition of the total demand and response.

C. ROLE OF THE HEURISTIC FORMULATIONS

The heuristic formulations discussed in paragraph B are logical and believed to be reasonably realistic. They are necessary elements of the model in that they couple the forces, attritions, resource demands, and expenditures together to influence the FEBA movement and other measures

$$\text{DEMAND FOR REINFORCEMENTS IN FRONT 1} = \left[\begin{array}{c}\text{SCALE}\\ \text{FACTOR}\end{array}\right] \times \left[\begin{array}{c}\text{ALLOWABLE}\\ \text{DENSITY}\end{array} - \begin{array}{c}\text{PRESENT}\\ \text{DENSITY}\end{array}\right] \times \left[\begin{array}{c}\text{COMMANDED}\\ \text{ADVANCE}\\ \text{RATE}\end{array} - \begin{array}{c}\text{ACTUAL}\\ \text{ADVANCE}\\ \text{RATE}\end{array}\right] + \left[\begin{array}{c}\text{REPLACEMENT}\\ \text{OF LOSSES}\end{array}\right]$$

$$\text{FLOW OF REINFORCEMENTS TO/FROM FRONT 1} = \left[\begin{array}{c}\text{MAX FLOW}\\ \text{RATE PER}\\ \text{UNIT}\end{array}\right] \times \left[\begin{array}{c}\text{UNITS}\\ \text{AVAILABLE}\\ \text{IN RESERVE}\end{array}\right] \times \left[1 - e^{\frac{-\text{DEMAND}}{\text{MAX RATE} \times \text{UNITS AVAILABLE}}}\right] \quad \text{FOR } D \geq 0$$

$$= \left[\begin{array}{c}\text{MAX FLOW}\\ \text{RATE PER}\\ \text{UNIT}\end{array}\right] \times \left[\begin{array}{c}\text{UNITS IN}\\ \text{FRONT}\end{array}\right] \times \left[\text{DEMAND}\right] \quad \text{FOR } D < 0$$

Figure II-2. Form of Demand/Response Equations

of relative combat capability. Since the formulations are heuristic, model results may be used to examine trends and key interactions, but the heuristic formulations cannot be used to predict precise real world outcomes. This means that results of an individual model run cannot be used to predict an actual FEBA position, but several runs can be compared to determine the relative impact of various force mixes, allocations, etc., on FEBA movement. Likewise, the model can not be used to predict when specific supplies will be exhausted, but it can be used to examine when supply scarcity may be a problem, and estimate the time period in the conflict when this may occur.

D. RESOURCE COUPLING AND ATTRITION/CONSERVATIONS

In COMBAT-II, RED and BLUE resources, such as supplies and munitions, are located within three fronts and their respective rear areas. Strict accounting is kept of the amount of each resource at each location. This amount changes over time due to flow into or out of a location and attrition at that location. There are usually several components contributing to the total attrition rate on resources. Strict accounting is kept of each contributory factor making up the attrition rate, the flow rate, and their integrals.

Examples of the resource coupling equations are shown in Figure II-3. These particular equations are for the number of ground units at one front and the number of aircraft. The first equation shows a flow term and five component attrition terms. No flow term appears in the second equation since aircraft are assigned to either short or long range bases and are never automatically moved by the model from one type of base to the other.

Resource coupling is illustrated by these two equations in that part of the attrition of ground forces is due to enemy air (first Equation). The loss rate due to enemy aircraft is proportional to the number of enemy aircraft, which involves the second equation. In the second equation, part of the attrition of enemy aircraft is due to area air defense. This attrition is proportional to the amount of area air defense, which is proportional to the number of ground units (first equation).

$$\begin{matrix}\text{TIME RATE OF}\\ \text{CHANGE OF}\\ \text{GROUND UNITS}\\ \text{IN FRONT 1}\end{matrix} = \begin{bmatrix}\text{GROUND UNIT}\\ \text{FLOW FROM}\\ \text{REAR TO}\\ \text{FRONT}\end{bmatrix} - \begin{bmatrix}\text{LOSS RATE}\\ \text{DUE TO}\\ \text{GROUND UNITS}\end{bmatrix} - \begin{bmatrix}\text{LOSS RATE}\\ \text{DUE TO}\\ \text{ARTILLERY}\end{bmatrix} - \begin{bmatrix}\text{LOSS RATE DUE}\\ \text{TO FRONTAL}\\ \text{MISSILES}\end{bmatrix} - \begin{bmatrix}\text{LOSS RATE}\\ \text{DUE TO}\\ \text{CENTRAL}\\ \text{MISSILES}\end{bmatrix} - \begin{bmatrix}\text{LOSS RATE}\\ \text{DUE TO}\\ \text{AIR}\end{bmatrix}$$

$$\begin{matrix}\text{TIME RATE OF}\\ \text{CHANGE OF}\\ \text{NUMBER OF}\\ \text{AIRCRAFT}\end{matrix} = - \begin{bmatrix}\text{LOSS RATE}\\ \text{DUE TO}\\ \text{INTERCEPTORS}\end{bmatrix} - \begin{bmatrix}\text{LOSS RATE}\\ \text{DUE TO AREA}\\ \text{AIR DEFENSE,}\\ \text{ALL TARGETS}\end{bmatrix} - \begin{bmatrix}\text{LOSS RATE}\\ \text{DUE TO POINT}\\ \text{AIR DEFENSE,}\\ \text{ALL TARGETS}\end{bmatrix} - \begin{bmatrix}\text{LOSS RATE}\\ \text{DUE TO}\\ \text{CENTRAL}\\ \text{MISSILES}\end{bmatrix} - \begin{bmatrix}\text{LOSS RATE}\\ \text{DUE TO AIR}\\ \text{ATTACKS}\\ \text{ON BASES}\end{bmatrix}$$

Figure II-3. Forms of Resource Coupling Equations

This type of coupling exists throughout the entire set of resource rate equations.

E. LEVEL OF AGGREGATION

In COMBAT-II, the basic ground unit is the combined arms company. The combined arms company has a capability and vulnerability appropriate to the combination of tanks, APC's, air defense systems, antitank weapons, personnel, and supplies that it represents. Conventional tube artillery is also aggregated with the combined arms company in the COMBAT-II air version. Artillery tubes are explicitly modeled and aggregated by type (up to 5 types) in the COMBAT-II artillery version. Army aviation is not played. Communications links and nodes are not explicitly modeled. They are assumed to exist however, and parameters that consider their effects are included.

The supplies of various kinds, e.g., POL, rations, etc., needed to support a ground unit are aggregated into an entity called a supply packet. A supply packet is treated as being the supplies required for a battalion or regiment for three days. Supply packets are consumed, and may be attrited either with their associated ground units or as separate tragets.

In addition to the supply elements mentioned above, the following items are explicitly represented with a constant tabulation being made of their numbers, capabilities, and vulnerabilities:

(1) nuclear artillery rounds

(2) short and long range missile launchers

(3) short and long range missile rounds

(4) three types of aircraft

(5) nuclear weapons for the aircraft

The spatial location of forces, systems, and resources is detailed only by a gront or the rear area over time. The model does not follow any

individual element of a force or system through an engagement and develop its history nor does it keep track of the specific location of these within a front or the rear.

Figure II-4 helps understand the level of aggregation. This is again the conservation equation for ground force packets in Front 1 as shown earlier, except that two of the terms in the equation are expanded to show their components. The time rate of change term on the left of the equal sign relates to the number of battalions or regiments respectively in the front. Each battalion is made up of three combined arms company packets. Each regiment is made up of ten combined arms company packets. The company packets are targeted and attrited, but the variable kept track of is the number of battalions or regiments. The flow of battalions or regiments to or from the front is defined in terms of the demand-response equations defined earlier. Note that fractions of units will occur. This in not felt to be a serious flaw, since, at the theater level, large numbers of units are involved, and the effects of these fractions will be insignificant.

The third expanded term shows how the frontal nuclear missile systems couple with the ground unit equations. The missile flow is described in terms of a number of variables, and is also coupled to the other systems.

F. STRENGTHS AND LIMITATIONS

(1) Strengths of COMBAT-II

(a) COMBAT-II takes an integrated approach to a two-sided, mixed conventional and nuclear conflict involving simultaneous interactions among ground, missile, and air forces at the theater level.

(b) The model enables the analyst to understand event causality factors, both primary and secondary. Time histories of over 1000 individual types of combat interactions are calculated in the model and made available to the anlyst.

$$\begin{matrix}\text{TIME RATE OF}\\ \text{CHANGE OF}\\ \text{GROUND UNITS}\\ \text{IN FRONT 1}\end{matrix} = \begin{bmatrix}\text{GROUND UNIT}\\ \text{FLOW FROM}\\ \text{REAR TO}\\ \text{FRONT}\end{bmatrix} - \begin{bmatrix}\text{LOSS RATE}\\ \text{DUE TO}\\ \text{GROUND}\\ \text{UNITS}\end{bmatrix} - \begin{bmatrix}\text{LOSS RATE}\\ \text{DUE}\\ \text{ARTILLERY}\end{bmatrix} - \begin{bmatrix}\text{LOSS RATE}\\ \text{DUE TO}\\ \text{FRONTAL}\\ \text{MISSILES}\end{bmatrix} - \begin{bmatrix}\text{LOSS RATE}\\ \text{DUE TO}\\ \text{CENTRAL}\\ \text{MISSILES}\end{bmatrix} - \begin{bmatrix}\text{LOSS RATE}\\ \text{DUE TO}\\ \text{AIR}\end{bmatrix}$$

NUMBER OF
BATTALIONS OR
REGIMENTS/HR
(3 CO/BN)
(10 CO/RGMT)

NEW FLOW
ACROSS BOUNDARY
OF REAR TO
FRONT

GROUND UNIT FLOW
DESCRIBED IN TERMS OF
DENSITIES, ADVANCE
RATES, AVAILABLE
REINFORCEMENTS AND
LOSS REPLACEMENTS
(SEE FIGURE II-2)

PARAMETERS

MAXIMUM FLOW RATE
COMMANDED ADVANCE RATE
ALLOWABLE TROOP DENSITY
SCALE FACTORS (C^3, TERRAIN, ETC)

COUPLED TO

ATTRITION RATES
NUMBERS OF RESERVES
NEEDS IN OTHER FRONTS

EQUAL TO
RATE OF MISSILE
FLOW INTO FRONT
TIMES KILL FACTOR

MISSILE FLOW DESCRIBED
IN TERMS OF DESIRED
LAUNCH RATE, TARGET
ACQUISITION FACTOR, AND
LAUNCHER SURVIVAL

PARAMETERS

MAXIMUM LAUNCH RATES
ACQUISITION FACTORS
KILL PROBABILITIES

COUPLED TO

ALL OTHER SYSTEMS THAT
CAN KILL MISSILES OR
LAUNCHERS

Figure II-4. Example of Some Expanded Terms of the Ground Unit Conservation Equation

(c) All values used in the COMBAT-II computations are user controllable variables. The capability of modifying the value of user selected variables "on the fly", i.e., during the simulation runs is a powerful tool provided by COMBAT-II.

(2) Limitations of COMBAT-II

(a) Only manual input strategies are played.

(b) The effects of delayed casualties and contaminated areas due to nuclear detonations are not modeled.

(c) Time histories of specific units are not followed.

(d) COMBAT-II provides for FEBA movement on three fronts but has no provision to represent breakthrough, overrun, encirclement and capture.

G. COMBAT-II EQUATIONS

The equations utilized in COMBAT-II may be understood through examination of the source code in conjunction with Appendix A. The source code contains extensive comments referring to the individual equations. The variable names used in the model are explained in Appendix A. Figure II-5 shows the FORTRAN-IV lines from the air model which represent the ground force conservation equation shown in Figure II-4, prior to inclusion of the flow factors. Note that every term is written as a subscripted variable. For example, A0403P is the missile attrition term described in Figure II-4. This is true for all combat elements values used by the model. There are no "hardwired" constants used in representing any combat process.

```
C************************************************************************
C        FIFTH EQUATION SET
C        FLOWS AND ASSOCIATED ATTRITION
         DO 5480 I=1,IF

C        G1 ATTRITION
C    EQN  (5-1) - TOTAL G1F (I) ATTRITION
         A0501P(I,IB) =A0301P(1,I,IB)+A0301P(2,I,IB)
        1+A0321P(1,I,IB)+A0321P(2,I,IB)+A0321P(3,I,IB)+A0401P(I,IB)
        2+A0402P(I,IB)+A0403P(I,IB)
    5480 CONTINUE
```

Figure II-5. Example of COMBAT-II Code

Note: All COMBAT-II variables are defined in Appendix A.

CHAPTER III

INPUT COMPONENTS AND MODEL STRUCTURE

A. INPUT CLASSIFICATION

The inputs for COMBAT-II may be divided into three generic classes: state variables, strategy variables, and interaction variables, as shown in Figure III-1.

1. State Variables

The state variables are equivalent to the "givens" in a particular problem. An example of this input class is the forces available to each side at the beginning of the conflict. This class includes the availability of additional assets as a function of warning or mobilization. Thus, for various mobilization/warning scenarios there would be different forces available. State variables are usually characterized by high levels of confidence in their accuracy. COMBAT-II, however, operates at a high level of aggregation. State variable values may therefore require transformation prior to model input. For example, if forces of different armies with different organizational structures are to be considered, the differing organizations must be transformed into a single equivalent organizational structure. Thus, even with state variables, there is the need to analyze the composition and structure of the entities they represent in order to insure proper translation. Examples of the type of analysis and translation required are depicted in Figure III-2.

2. Strategy Variables

Strategy variables are a class of variables which allow the user to specify options. For example, one option that might be investigated is the effects of alternative allocations of air assets to various attack missions. From such an investigation, insights may be gained into the impacts of these alternatives on the outcome of the theater conflict. The development of strategy variable input values requires research into opposing force doctrine, past operations, and, when available, the analysis of actual exercise data.

- STATE VARIABLES
  - FORCES AVAILABLE OVER TIME
  - DERIVED FROM INVENTORIES AND INTELLIGENCE
  - MODERATE TO HIGH CONFIDENCE RANGE

- STRATEGY VARIABLES
  - MISSION ALLOCATIONS
  - ANALYTICALLY SPECIFIABLE
  - MAY VARY OVER A WIDE RANGE

- INTERACTION VARIABLES
  - PKS, ACQUISITION FACTORS
  - PHYSICAL CALCULATIONS
  - LOW TO MODERATE CONFIDENCE

Figure III-1. Characteristics of Generic Input Classes

NUMBER OF BASES

- FORWARD VS REAR
- US VS ALLIED
- NUCLEAR MUNITIONS AVAILABILITY
- NUMBER/TYPE AIRCRAFT AT EACH

FORCES

- MANEUVER UNITS PER FRONT
- UNIT DENSITIES
- INDIGENOUS WEAPONS
- RESERVE FLOWS
- SUPPLY AVAILABILITY

Figure III-2. Examples of State Variables Requiring Research and Analysis

3. Interaction Variables

Interaction variables include such inputs as the probabilities of kill and acquisition. These variables are usually based on empirical data and therefore have a low to moderate confidence level. Data which are of the "one-on-one" type must be aggregated to a "many-on-many" level for use in COMBAT-II. In general, this aggregation requires a considerable amount of preparation time and the resultant inputs should be considered as being among the most likely candidates for sensitivity analysis.

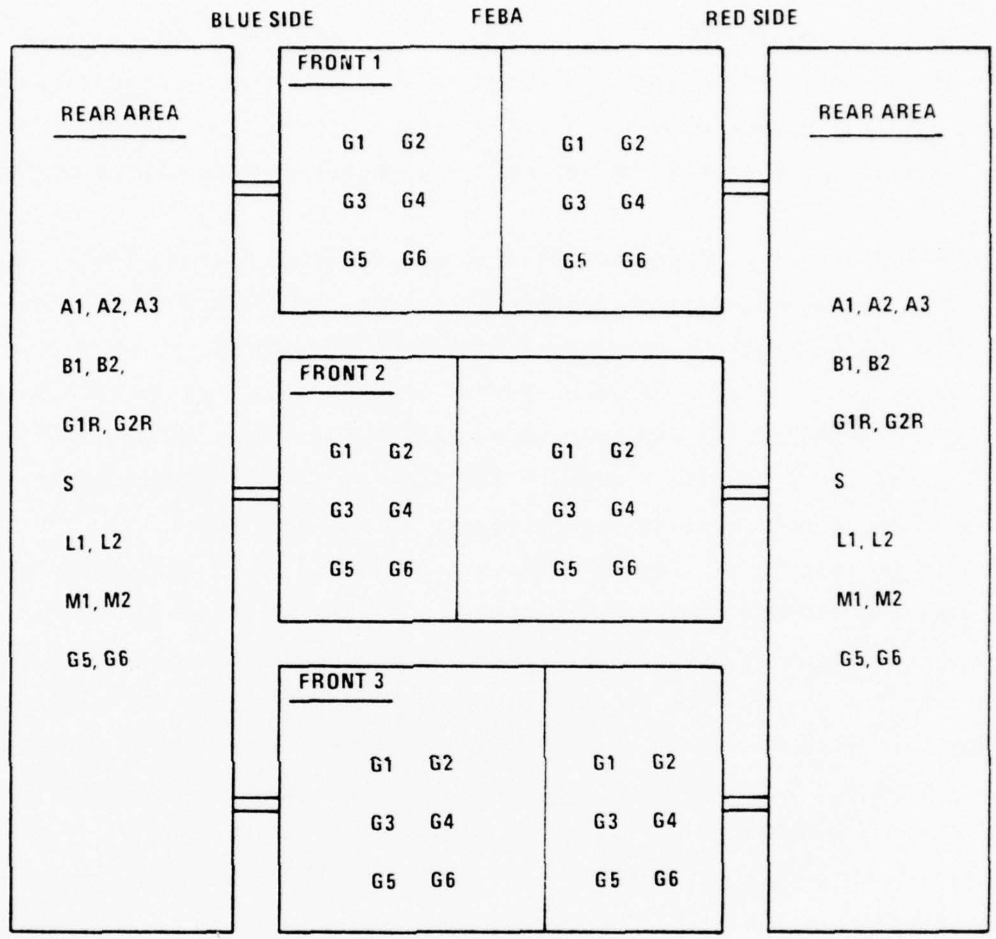
The remaining sections of this chapter will discuss COMBAT-II in terms of its structure and processes and the input data associated with those processes. The variables will not be identified as state, strategy or interaction in the following discussions but rather by their specific variable names.

B. OVERVIEW OF COMBAT-II STRUCTURE

COMBAT-II is a computerized model of simultaneous air/ground combat at the theater level with the capability to play conventional, nuclear, or mixed interactions. It has been designed to operate as an aggregate model providing an overview of theater level mixed combat exchanges and to determine the key factors affecting a conflict outcome.

The following discussion will be limited to the processes and input considerations that are common to both the air and artillery versions of COMBAT-II. The air version will be used to illustrate the discussion.

The air version of the model portrays the conflict as having three fronts and a rear area (Figure III-3). Activity in Front 1 is viewed as the driving force for the rest of the model. The movement of the FEBA in the other two fronts is derived as a function of the FEBA movement in Front 1. Therefore, Front 1 always represents the main area of attack. The combat elements within a front consist of Ground Force packets (G1), Supply packets (G2), Artillery (G3) and associated rounds (G5) and Frontal



REAR AREAS

- A1, A2, A3 – 3 TYPE AIRCRAFT
- B1, B2 – 2 TYPE AIRBASES
- G1R, G2R – RESERVE GROUND FORCES AND SUPPLIES
- S – NUCLEAR STORAGE SITES
- L1, L2 – NUCLEAR MISSILE LAUNCHERS
- M1, M2 – NUCLEAR MISSILE WARHEADS
- G5, G6 – ARTILLERY ROUNDS AND FRONTAL MISSILE WARHEADS

FRONTS

- G1 – GROUND FORCES
- G2 – SUPPLIES
- G3 – ARTILLERY TUBES
- G4 – SSM LAUNCHERS
- G5 – ARTILLERY ROUNDS
- G6 – NUCLEAR SSM WARHEADS

Figure III-3. Air Model

Surface-To-Surface Missile (SSM) Launchers (G4) and their warheads (G6).*
The fires of artillery systems located within a front may be directed only at the opposing ground forces, supplies, and systems in that front. Similarly, ground force packets may attack only opposing ground force packets in that front.

In the rear area, there are Reserve Ground Force packets (G1R), Rear Supply packets (G2R), Nuclear Storage Sites (S), and Centrally Controlled SSM Launchers (L1 and L2) with their warheads (M1 and M2), as well as artillery rounds and frontal missile warheads (G5, G6). In a European conflict, the Centrally Controlled SSM Launchers might be used to simulate the Pershing and Lance missile systems. The frontal missile system might represent the Honest John missile system in use by non-U.S. corps.

Also located in the rear are the air bases and their aircraft. The air bases are divided into two categories. Air bases which are within range of the opposing centrally allocated SSM's are designated as B1 while bases that are beyond this range are designated as B2. The aircraft are divided into three nominal types. The A1 aircraft are normally considered to be interceptors that engage enemy aircraft and then return to their base. They are not nuclear capable. The A2 aircraft are normally used in a ground support role and are nuclear capable. The A3 aircraft are normally the long range aircraft that may be used in either the ground support role or the interdiction role and are also nuclear capable. These roles are, however, under the control of the user and may be changed at any time. Aircraft and centrally controlled SSM's may attack targets in the opposing rear or in any of the three fronts. The model has the capability to permit user reallocation of the aircraft and SSM's between missions during the conflict simulation. The time at which these changes are to take place must, however, be determined prior to beginning the simulation run.

---

*In the artillery version, five frontal weapon systems are portrayed, and they are designated W1, W2, W3, W4, and W5. The rounds fired by these systems are R1, R2, R3, R4, and R5.

C. COMBAT PROCESSES

1. Air Interactions

The air battle is graphically illustrated in Figure III-4. As mentioned previously, there are three types of aircraft played as well as two types of bases. The number of aircraft, by type, the number of bases by type, and the number or percentage of each of the three aircraft types located on these bases are some of the variable inputs required by the model. In a European conflict, the NATO forces have a variety of aircraft available for use. An analysis is required to categorize these aircraft into one of the three aircraft types modeled in COMBAT-II. The number of airbases available and their location relative to each other must be determined in order to classify them into the permissible COMBAT-II types. In addition, a number of additional factors, listed in Table III-1, which affect also air operations and input must be considered.

Table III-I. Air Base Parameters

NUMBER OF FORWARD AIR BASES (B1)
STATE OF REPAIR FOR THE FORWARD BASES
REPAIR RATE FOR THE FORWARD BASES
NUMBER OF LONG RANGE BASES (B2)
STATE OF REPAIR FOR THE LONG RANGE BASES
REPAIR RATE FOR THE LONG RANGE BASES
NUMBER OF CONVENTIONAL MUNITION LOADS FOR AIRCRAFT (A4)
RATE OF EXTERNAL SUPPLY OF CONVENTIONAL MUNITIONS
NUMBER OF NUCLEAR MUNITION LOADS FOR AIRCRAFT (A5)
RATE OF EXTERNAL SUPPLY OF NUCLEAR MUNITIONS
CONV WEAPONS LOST PER A1 IN A CONV ROLE LOST ON THE GROUND
NUC WEAPONS LOST PER A2 IN A NUC ROLE LOST ON THE GROUND
CONV WEAPONS LOST PER A2 IN A CONV ROLE LOST ON THE GROUND
NUC WEAPONS LOST PER A3 IN A NUC ROLE LOST ON THE GROUND
CONV WEAPONS LOST PER A3 IN A CONV ROLE LOST ON THE GROUND

The air battle begins with the launching of aircraft on both sides. At the beginning of the simulation when there has been no damage to either side's bases, the aircraft will be launched at or near the maximum sortie rate provided by the user. As the simulated conflict continues, aircraft will be launched as a function of:

(1) the number of aircraft at the air bases;

(2) the munitions available at the air bases;

(3) and the state of repair of the air bases.

Figure III-4 illustrates the sequence of the air battle from the BLUE point of view. After aircraft are launched, they are subject to being detected and engaged by the opposing side's interceptors. Aircraft assigned to a bombing mission must survive the air-to-air battle before being able to execute their primary mission. During the conduct of the bombing missions, aircraft are subjected to both local (point) and area air defense attack.

Each type aircraft must be allocated to one or more of the available missions. Figure III-5 depicts the possible allocations. Interceptor type aircraft will normally be allocated almost exclusively to the air-to-air mission, long range aircraft to the air-to-ground missions, with priority to targets in the rear, and close-air-support aircraft to the air-to-ground role with priority to frontal forces. Priorities are reflected in the fractional size or percentage of the force allocated to the various missions.

In addition to the air allocation input data, there are a number of additional inputs that are required for each type of aircraft. They include the following:

(1) the munitions loading per aircraft;

(2) the maximum sortie rate permitted;

(3) and the kill probabilities against each type target.

2. Target Acquisition

Target acquisition is one of the key components of any combat model. The target acquisition process can be viewed in terms of five functional groupings: allocation of acquisition means, acquisition of the target,

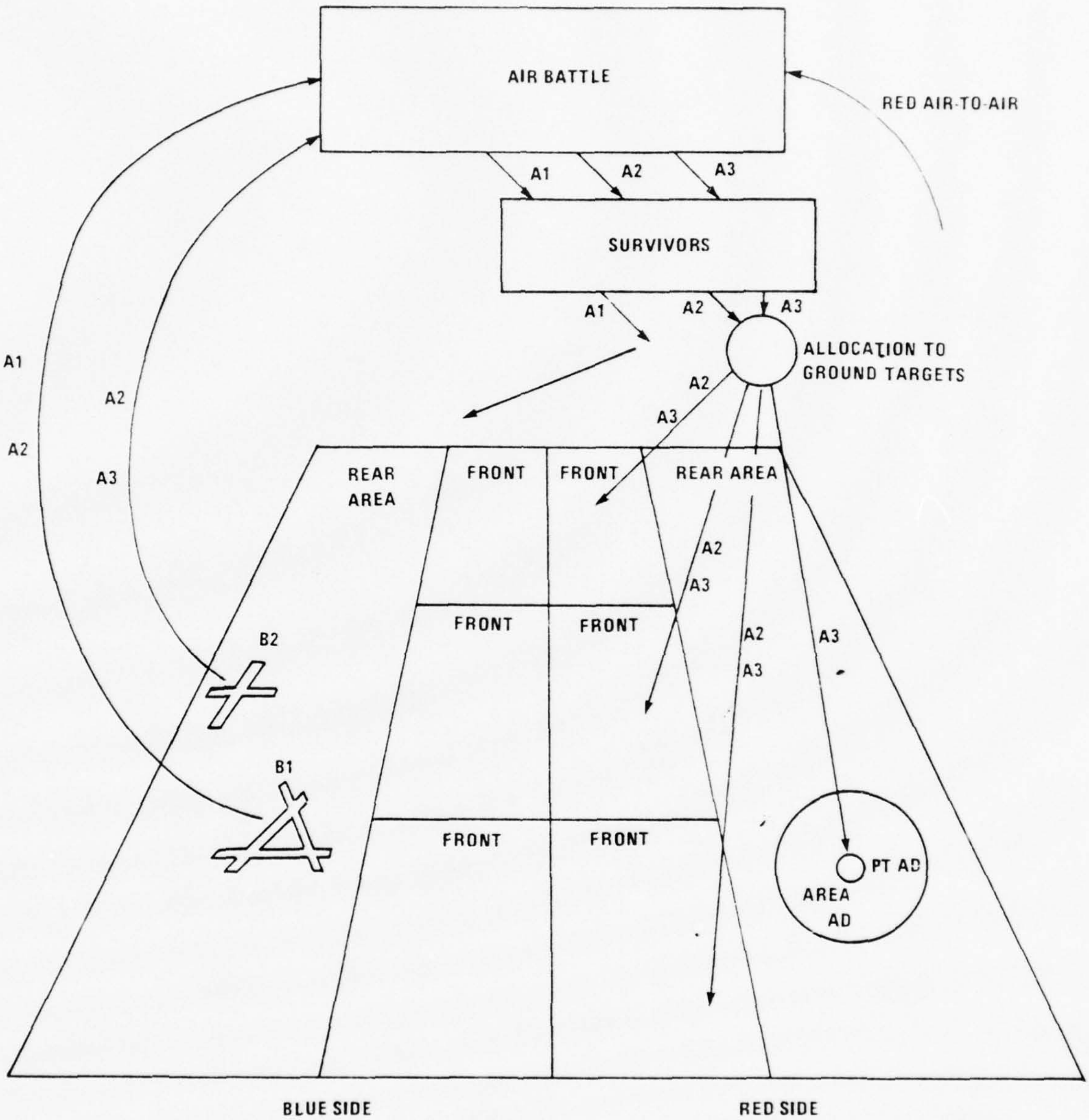


Figure III-4. Diagramatic Representation of Air Combat

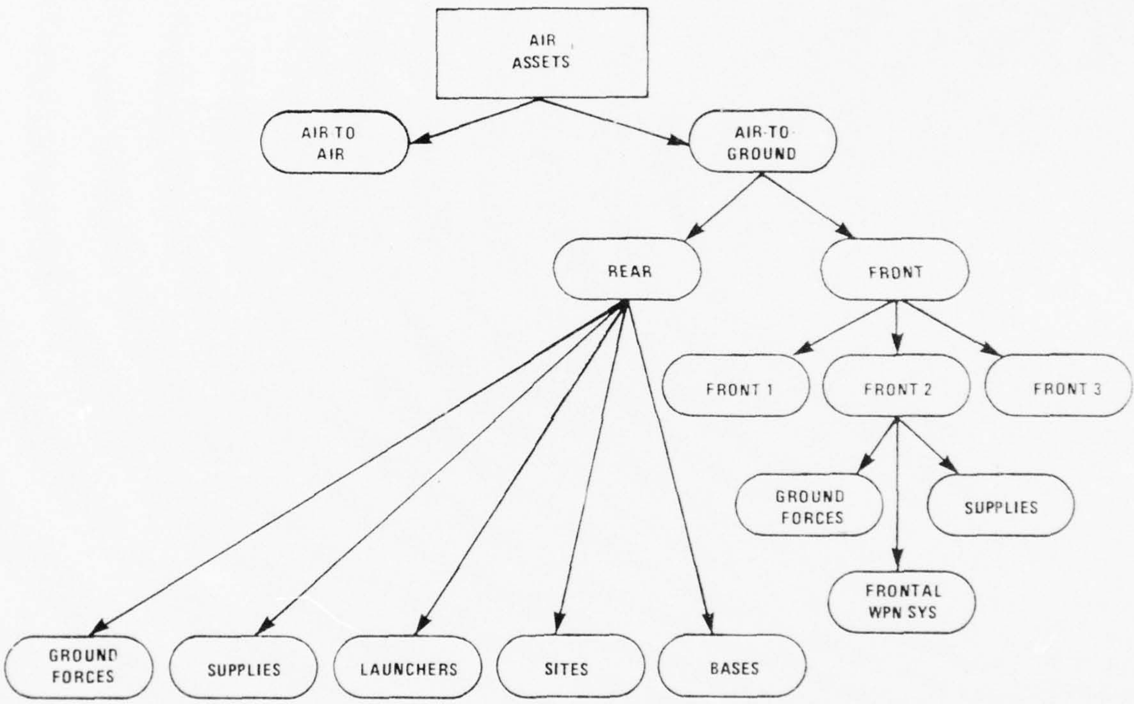


Figure III-5. Allocation of Air Assets

evaluation of the acquisition report, allocation of attack means to the target, and attack. To date, however, no model has been able to adequately capture all the facets that make up the target acquisition process.

The approach used in COMBAT-II has been to concentrate on the acquisition/attack process after acquisition has occurred through some sensor or visual means and the sensor report has been evaluated. COMBAT-II expresses this situation as a percent-of-knowledge value input by the user for the various target elements. The next step in the process is the allocation of attack systems. This allocation is made as a function of the range of the various attack systems, the number of the systems available to execute a particular type mission and the input allocation by target type.

Figure III-6 provides a graphical representation of the COMBAT-II acquisition process using PACT ground forces in Front 1 as the target. A certain percent of the ground forces for each side start the engagement as acquired targets. This percentage is input data reflecting NATO and PACT acquisition capabilities. The percent of target knowledge varies as a function of the rate of acquisition and loss rate of acquired targets during simulation operation. As PACT ground forces flow into Front 1, they are acquired at a rate signified by λ. This fraction is added to the acquired pool of ground force targets for Front 1. Once acquired, these targets are subject to attack by all the systems which are both in range and allocated against ground forces. Acquired targets have three means of leaving the acquired pool of targets. They can be moved to the rear based on the demand equations discussed in Chapter 2. They can be attacked and eliminated, or they can become unacquired. Targets become unacquired at a rate signified by μ, which is a function of the target type, its survival time and disengagement time. The acquisition process is continuously occurring throughout the engagement. Table III-2 contains a listing of acquisition inputs required for this process.

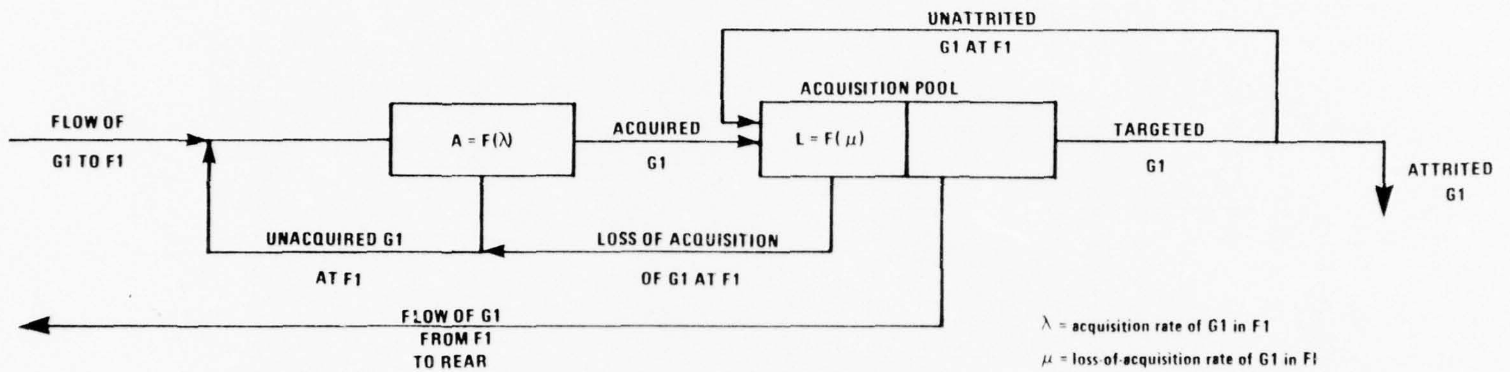


Figure III-6. Target Acquisition Process

Table III-2. Acquisition Input Parameters

FRONTAL GROUND FORCES:	INITIAL PERCENT OF KNOWLEDGE
	FRACTIONAL RATE OF ACQUISITION
	FRACTIONAL RATE OF LOSS OF KNOWLEDGE
FRONTAL SUPPLY PACKETS:	INITIAL PERCENT OF KNOWLEDGE
	FRACTIONAL RATE OF ACQUISITION
	FRACTIONAL RATE OF LOSS OF KNOWLEDGE
REAR GROUND FORCES:	INITIAL PERCENT OF KNOWLEDGE
	FRACTIONAL RATE OF ACQUISITION
	FRACTIONAL RATE OF LOSS OF KNOWLEDGE
REAR SUPPLY PACKETS:	INITIAL PERCENT OF KNOWLEDGE
	FRACTIONAL RATE OF ACQUISITION
	FRACTIONAL RATE OF LOSS OF KNOWLEDGE
LONG RANGE WEAPON SYSTEM 1:	INITIAL PERCENT OF KNOWLEDGE
	FRACTIONAL RATE OF ACQUISITION
	FRACTIONAL RATE OF LOSS OF KNOWLEDGE
LONG RANGE WEAPON SYSTEM 2:	INITIAL PERCENT OF KNOWLEDGE
	FRACTIONAL RATE OF ACQUISITION
	FRACTIONAL RATE OF LOSS OF KNOWLEDGE

3. Movement of Resources

Resources are located at the three fronts and in the rear area. The quantity of resources located in each area changes with time as a function of flows into or out of the area due to frontal demands, and total attrition within the area. A strict accounting is kept of both the causal factors of attrition and the resource flows.

Figure III-7 illustrates the resource flows that are simulated. Resources flow only from rear to front and from front to rear. Resources can be moved from one front to another only by being withdrawn to the rear and subsequently allocated to another front. Resources may not flow directly from one front to another. The direction of flow for a particular front is dependent on the battle situation at that front as well as the difference

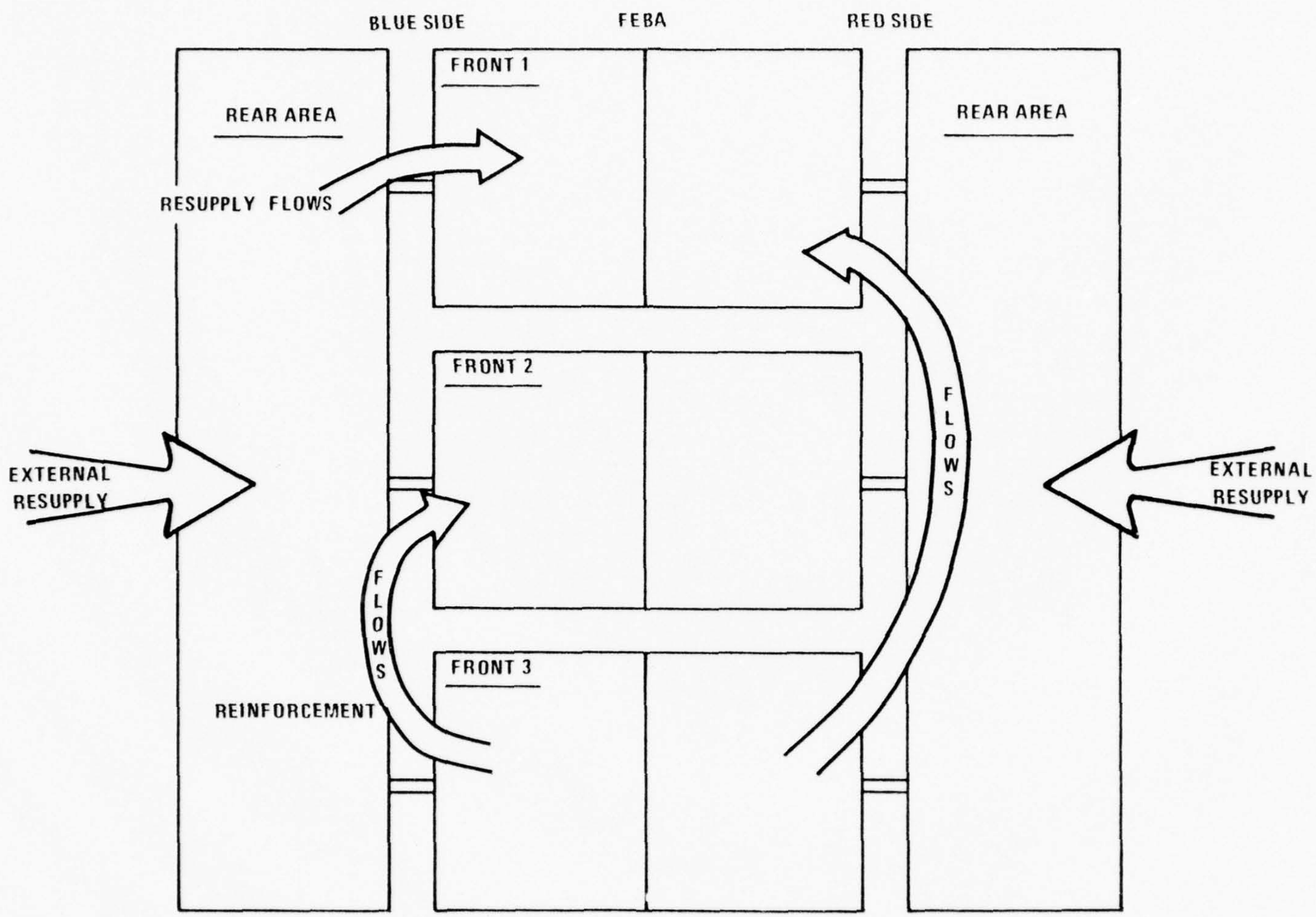


Figure III-7. Typical Flows Allowed in COMBAT-II

between the desired supply level and the current supply level. The actual demand/response equations were discussed in Chapter II.

In addition to the dynamic internal flows, COMBAT-II permits the introduction of additional units and material resources. This flow is termed "external resupply" and it provides the capability to allow new resources to be introduced into the rear area of each side during the course of the simulation conflict. This permits reinforcement packages into Europe after the start of a conflict. As an example of this process, if a reinforcing package is assumed to be composed of 12 ground force packets (G1) and 6 frontal weapon systems (G4) and the elements are to become operational over a 24-hour period beginning on the fourth day of the conflict, the user provides the model with the following information:

(1) for G1 Hour 72, External Resupply Rate is .5

(2) for G4 Hour 72, External Resupply Rate is .25

(3) for G1 Hour 96, External Resupply Rate is 0.0

(4) for G4 Hour 96, External Resupply Rate is 0.0

The external resupply rate is expressed in terms of units per hour and the user must specify both the beginning and end of the period over which external resupply is to occur.

D. MODIFICATION OF COMBAT ELEMENTS DURING A SIMULATION RUN

The ability to cause rates and quantities to change during a simulation run is a powerful feature of COMBAT-II. As will be explained in detail in Chapter IV, this is accomplished by submitting "modification cards" with the simulation run. Sensitivity analysis studies are greatly facilitated by this capability. As an example of how variable values might be changed during a run to reflect changes in the combat situation, the transition from a conventional to a nuclear conflict is discussed below.

Modeling nuclear release in the artillery version is done in a manner analogous to the introduction of external supplies. Inputs must be made to change the appropriate variable values. In order to minimize the number of inputs necessary to change from a conventional to a nuclear environment,

no one model weapon system, W(i), should represent both nuclear and non-nuclear certified tubes. In addition, each nuclear system to be modeled should be represented by a different W(i).

Assume that BLUE W1, W2, and W3 are used to represent 155 mm cannons capable of delivering three different yields of nuclear shells, and W4 represents eight inch nuclear capable artillery. All conventional artillery is then aggregated in W5. The initial inputs of the run might represent the rounds being fired by all systems, R1, R2, R3, R4, and R5, as conventional. The probabilities of kill, firing rates, numbers of available rounds in each front, and allocations to targets would be set appropriately. If after one day, W1 and W4 are to fire nuclear rounds for six hours and then stop, the necessary input information would consist of new values for the firing rates of W1 and W4, new numbers of rounds R1 and R4, new probabilities of kill against all possible targets, and new target allocation schemes for both systems. These values would take effect at Hour 24 and a similar set of inputs would be required to return these systems to the conventional mode at Hour 30. If at the end of two days all four nuclear frontal artillery systems are to be used for six hours, complete sets of inputs must be given for all four systems for Hour 48 and Hour 54. Of course, if a weapon system is used only for nuclear delivery, it is necessary to change only the firing rate. The original input data can include appropriate numbers of rounds, allocation to targets, and so on. For example, RED W1 and W5 might be different conventional artillery systems and W2, W3 and W4 could be FROG missiles having three different nuclear warheads for different yields. If only the lowest yield (e.g., W2 using R2) is to be employed for three hours following the first BLUE nuclear attack described above, the input would consist of:

(1) for W2 Hour 30, Max Firing Rate per Weapon is X

(2) for W2 Hour 33, Max Firing Rate per Weapon is 0.

Here "X" is a number which represents a realistic firing rate for this system. The number "X" must be developed prior to running the model. It is assumed that all other information defining nuclear characteristics for the RED W2, W3, and W4 systems was input as part of the initial variable values.

It should be noted that any one weapon system for a given side cannot fire both conventional and nuclear rounds simultaneously. Thus, it is not necessarily a good idea to use the different frontal weapon systems simply to reflect different sizes of artillery tubes.

The delivery of nuclear munitions by aircraft in air-to-ground missions occurs whenever a sufficient quantity of A5's are available to a given side. If nuclear release is not to occur until some time after the beginning of a simulation, a supply of A5's should not be included as part of the initial value inputs, although all other related inputs, such as expenditure rates, probabilities of kill, etc., may be input initially. Thus, if nuclear release is at Hour 10 and nuclear loads are to be delivered for six hours, the minimal input required to model these events is:

(1) for A5 at Hour 10, Total Number is Y

(2) for A5 at Hour 16, Total Number is 0

where the number "Y" must be a realistic number of available loads.

Of course, the scenario being played may dictate that nuclear munitions are only to be used against specific target types, long range air bases, for example. In that case, the allocation schemes would also have to be altered. In addition, if A2's represent air-to-ground capable planes that cannot strike long range targets, it would be necessary to ground them by setting the Maximum Desired Launch Rate for A2's to zero.

Note that all A2's and A3's will be eligible to fly nuclear sorties if A5's are available. The air model generates a mix of conventional and nuclear A2 and A3 missions internally. The artillery model makes all A2 and A3 missions either conventional or nuclear.

Delivery of nuclear or conventional munitions by the central missile systems is handled in exactly the same manner as delivery by frontal weapon systems, except that there are a larger number of targets to which fire can be allocated.

Any of the initial input variables may be changed by the user at some predetermined simulation time. As a result, the effects of variation in the rates of movement, rates of flow, firing rates, inventories of weapons, probabilities of kill, or allocation schemes on the combat elements represented in COMBAT-II can be readily studied.

CHAPTER IV

OPERATION OF THE COMBAT-II SYSTEM

A. INTRODUCTION

The purpose of this chapter is to provide the user with the information necessary to run the COMBAT-II programs.

The optional and required control inputs for each program are explained in detail along with the file requirements. The outputs resulting from each program option are explained and their use in succeeding programs is discussed.

Examples of the Job Control Language (JCL) used to run each program may be found in Appendix C. Sample model control and data inputs for each program are also presented with the appropriate JCL. In order to fully understand the COMBAT-II program, this chapter should be used in conjunction with the Program Design Language (PDL) shown in Appendix B, the COMBAT-II variables explained in Appendix A, and the source code listing shown in Appendix D. The PDL provides an abstracted presentation of the control logic utilized in the COMBAT-II program.

B. OVERVIEW

The COMBAT-II system consists of four programs: a processor for initial data base generation; the processor program; a postprocessor providing tabular output; and a postprocessor providing plotted output.

The preprocessor program, called FORMS, generates a portion of the simulation inputs directly and a number of user aids for developing a data base. FORMS uses a card deck containing a variable dictionary and a variable cross-reference index as inputs to produce a variable dictionary file, a punched card deck containing the data base input variables in NAMELIST format, and a printed set of variable cross-references and descriptions to assist the user in developing and entering the data base values. Figure IV-1 shows a procedural block diagram of the use of the FORMS program.

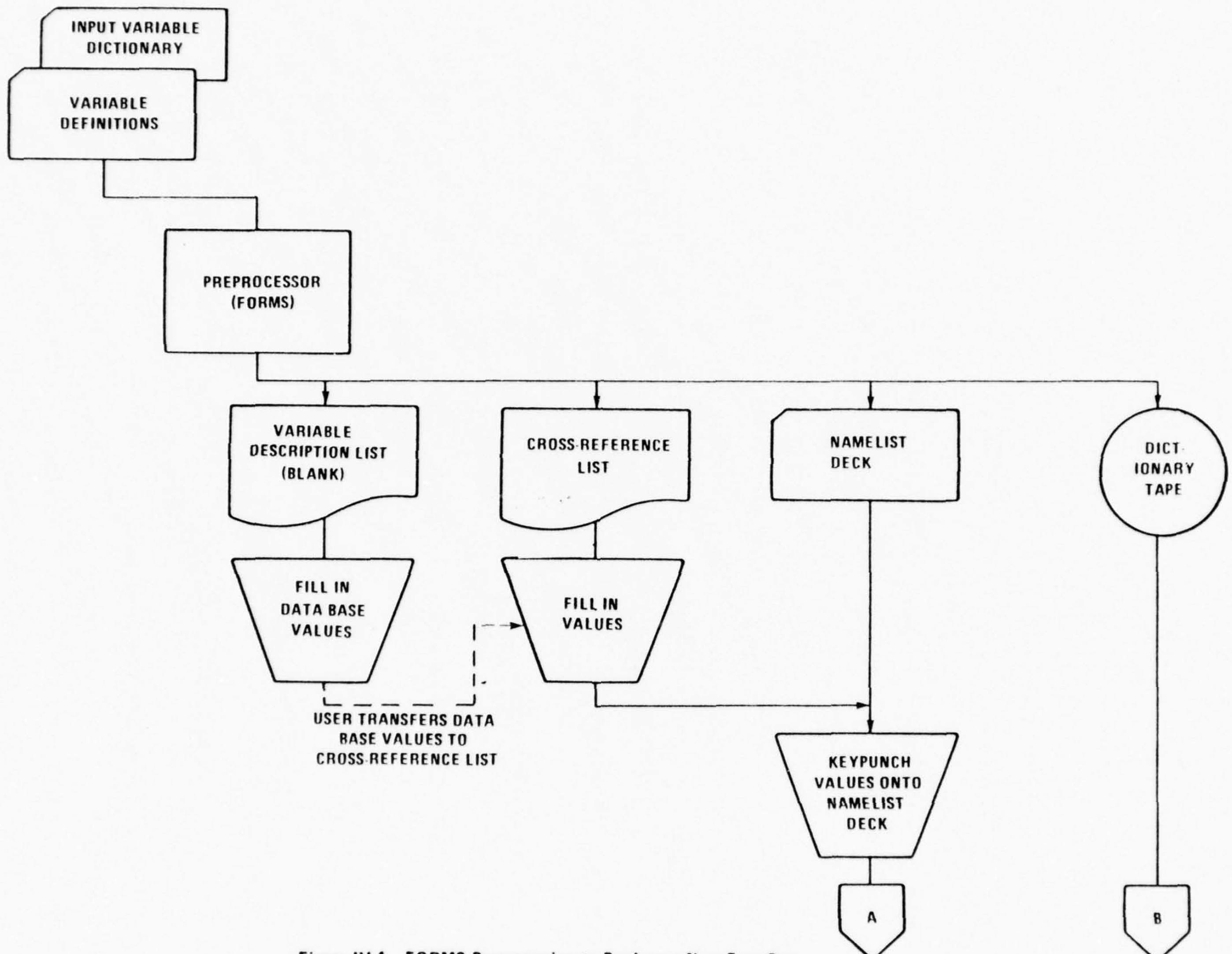


Figure IV-1. FORMS Preprocessing to Produce a New Base Case

The processor program, called COMII, has three modes of operation. In the creation mode, an initial data base file is generated and the model operates utilizing the initial values supplied by that data base. In the normal mode, either a data base generated during a creation mode run or the output file of a previous normal run is employed to initialize the model variables. Finally, in the restart mode the output file from a previous run is used to resume the simulation at some user specified time. The output file from each run contains the data base utilized for variable initialization at the start of that run.

The output of the processor program includes printed statistics of the simulation integrator operations and a permanent file containing the state of all variables at user specified time intervals. The processor contains two major subroutines, referred to as AIRMODL for the air model, and ARTMODL for the artillery model. The differences between these two models have been explained in previous chapters. The procedural block diagram of the simulation is shown in Figure IV-2.

Due to the differences in the output of the air and artillery models, two separate tabular postprocessor programs, ARTOUT for the artillery model, and AIROUT for the air model, are provided. These two programs operate independently of each other.

The appropriate postprocessor program accepts the output file generated by the processor and user control cards as input. The data output by the processor is formatted and printed. The user may request that either the rates of change of values or the actual values for each combat element or weapons system over a time range be printed. ARTOUT and AIROUT provide the variable values in a tabular format.

A plotting program, named GRAPHC2, provides printer plots of user selected variables over time. The inputs are the processor output tape and run control cards giving the variables to be plotted. The output includes a table of contents of the graphs requested, a listing of the variable values plotted on each graph, and the plots themselves. Up to 14 variables may be plotted on a single graph. A temporary scratch file is used to build the graphs. A procedural block diagram of ARTOUT, AIROUT, and GRAPHC2 is shown in Figure IV-3.

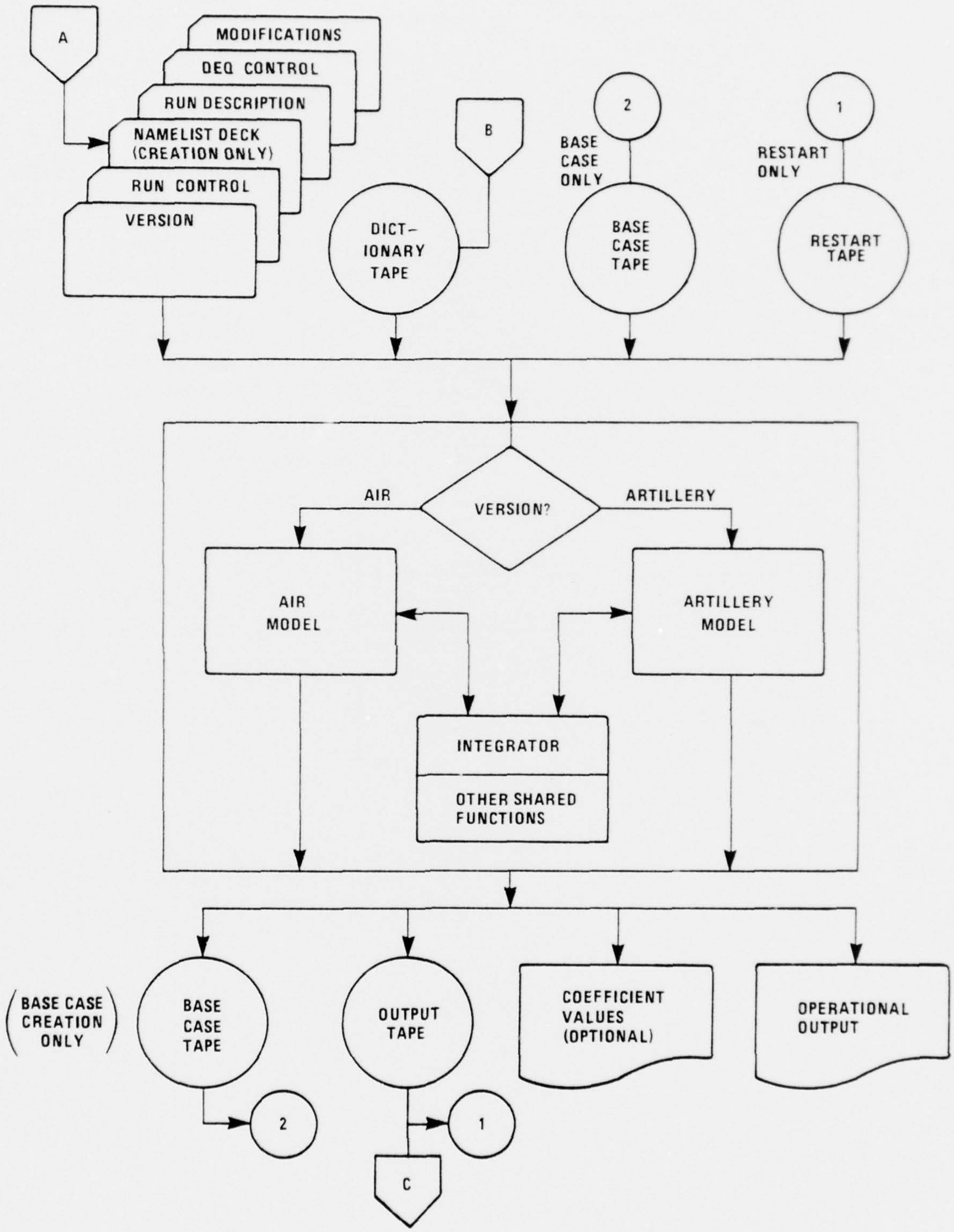


Figure IV-2. Processor (Model)

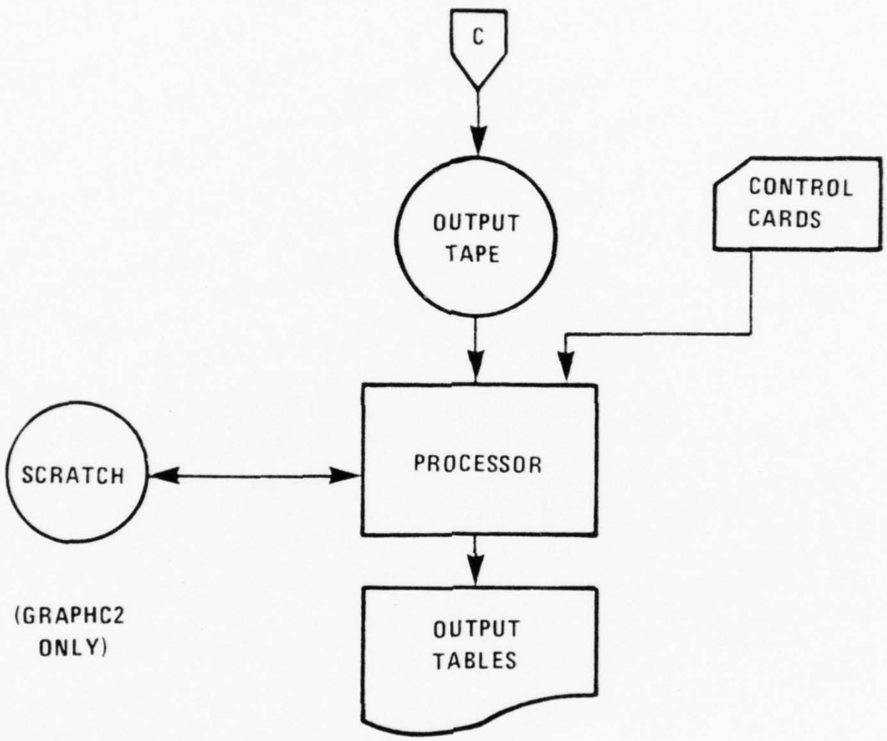


Figure IV-3. Postprocessor

C. PREPROCESSOR (FORMS PROGRAM)

1. Inputs

The FORMS input data deck consists of a model control card followed by two card decks separated by a single "EOR" (6-7-8 punch in CC1) card. The air and artillery models require different sets of card decks. The model control card specifies whether FORMS is being run for the air or artillery model by having either "AIR" (CC1-3) or "ARTILLERY" (CC1-9) on the control card.

The first file, referred to as the variable definition file, contains the variable names with their associated subscript specifications and an abbreviated description of the use of the variable. All combat element variable names (input, computed, and output) utilized by COMBAT-II are contained in the variable definition file. The primary naming convention used by COMBAT-II is an X suffix for user input variables and a P suffix for program computed variables. The only exceptions to this convention are for the program computed V and AV variables which represent actual values, the VO variables which are input variables, and those variable names containing DV which represents rates of change.

Each variable definition file record consists of four alphanumeric fields. Field 1 (CC1-6) is used for the variable name with CC6 containing the X or P suffix. The remaining three fields (CC9-10, 12-13, 15-16) contain subscript designators used to represent the subscript dimensionality for that variable. These designators are transformed into the actual subscripts in FORMS and then become part of the outputs. The reader should see Appendix A for the order in which the variable definition records should be placed. This file is used to generate the NAMELIST format punched card deck, the variable definition portion of the output file, and the cross-reference listing.

The second file, referred to as the variable dictionary file, contains the input variable names along with descriptions of their meaning and use. The variable dictionary file is used to generate the variable name and description portion of the output file and the variable description listing.

A FORMS variable dictionary file record contains five fields. Field 1 (CC1-6) contains the input variable name. Fields 2, 3, and 4 (CC7-8, 9-10, 11-12) hold the subscript(s) associated with that particular variable name. The remainder of the record (CC13-80) holds the alphanumeric description of the variable.

In addition to the variable descriptions, the variable dictionary file contains three types of control cards which provide user options for formatting the printed variable dictionary. A "TITLE1" (CC1-6) control record skips to a new page, prints the words "RED" and "BLUE" at the right hand side of the page, prints the title contained on the remainder of the control card and prints an underline across the page. The "TITLE2" (CC1-6) causes the same actions but without the page skip or words "RED and "BLUE" printing. The "SPACE" (CC1-5) card prints a blank line if the remainder of the card is blank, otherwise a line skip is performed, the remainder of the card printed and another line skip performed. A complete listing of the input decks for the air and artillery models appears in Appendix A.

The FORMS input deck appears as follows:

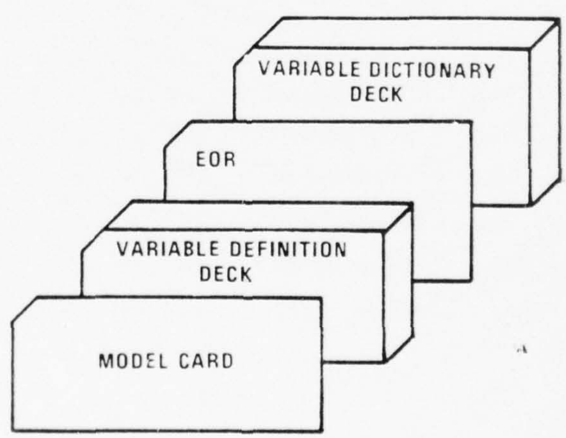


Figure IV-4. FORMS Input Data Deck

2. File Unit Numbers

TAPE5 is the input file for the FORMS program. The output to the printer is TAPE6 and the FORMS output file used by the simulation program (COMII) is written to TAPE7. TAPE8 is a scratch file used to assemble TAPE7, and TAPE9 is the punch output file for creating the NAMELIST deck. The TAPE9 file is not actually punched by the FORMS program, and thus an additional utility program must be utilized to generate the card deck itself.

3. Outputs

As shown in Figure IV-1, and mentioned previously, FORMS provides four outputs: a listing of the input variable names with their descriptions, grouped by their relationships; a listing of the individual variables in the same order as they appear in the NAMELIST deck, cross-referenced to the description listing and with index numbers (the use of these index numbers will be explained in a later section); a permanent file containing the variable dictionary and descriptions; and a punched card file in NAMELIST format with the actual data values left blank.

The permanent file is written in two sections. The first section contains all COMBAT-II variable names, both input and computed, associated with the combat elements. The second section contains the variable names and descriptions of all the user input variables.

The procedure for using the two output listings to develop a data base is as follows:

(1) The user fills in the appropriate initial values for both RED and BLUE on the variable description listing in the spaces provided. (Step 1, Figure IV-5).

(2) The values are then transcribed onto the cross-reference listing. (Recall that the description list has the variables grouped by function and with descriptions of their meaning while the cross-reference listing presents the variables in the same sequence as the cards in the NAMELIST deck.) Index numbers are provided on both the cross-reference listing and on the description listing to facilitate the location of variable names during the transcription process. Additionally, the variable names are arranged in alphabetical order on the cross-reference listing. (Step 2, Figure IV-5).

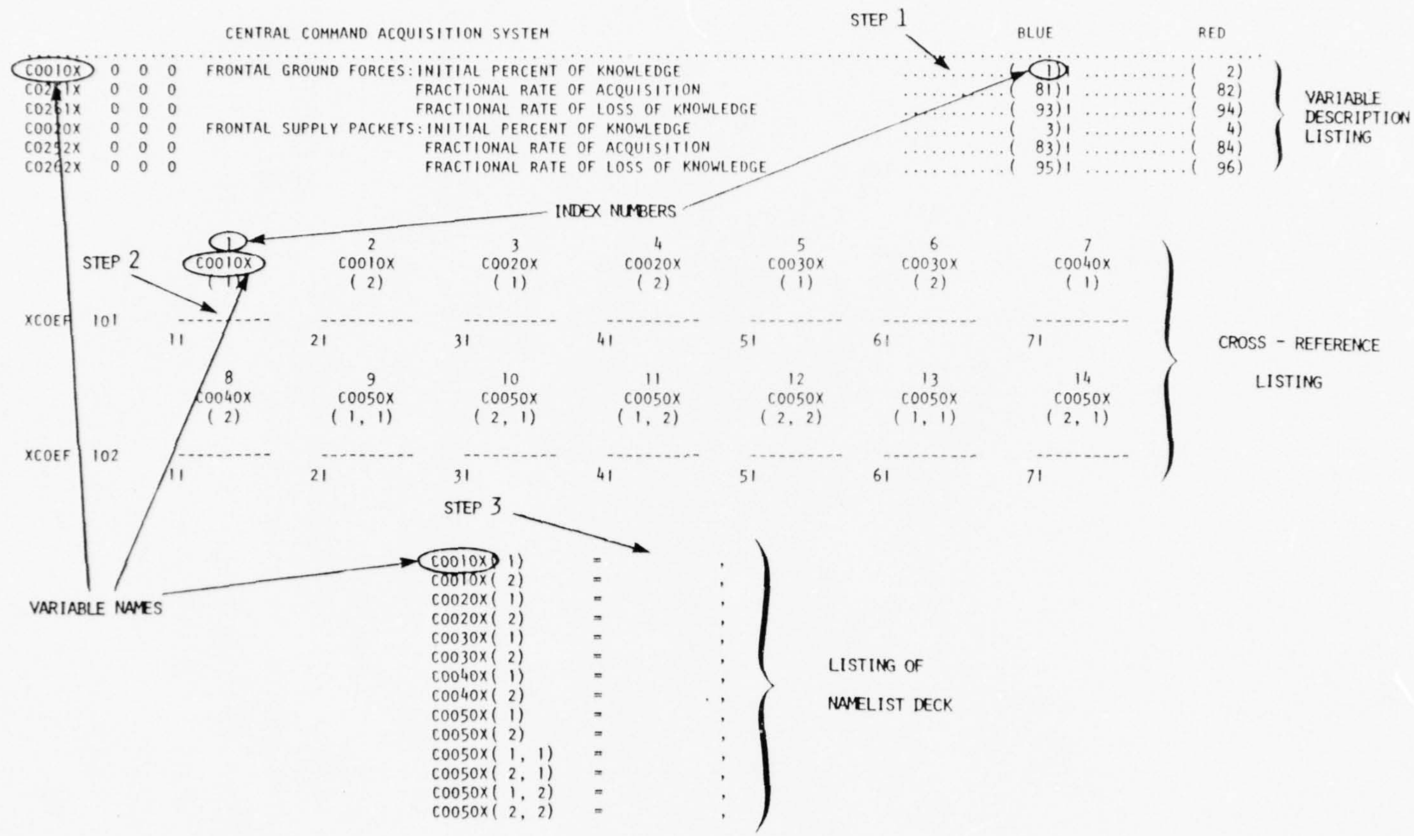


Figure IV-5. Examples of Input Aids Produced by FORMS

(3) The cross-reference listing with the transcribed values placed in the provided positions, permits the punching of the values in the provided empty fields of the NAMELIST deck, in the same sequence as the deck was punched by the FORMS program. In other words, no shuffling of cards is necessary and no mistakes will be made in the spelling of variable names. (Step 3, Figure IV-5).

The NAMELIST method of inputting the initial base values to the model was chosen to provide additional documentation of the input. While the resulting card deck is quite large, BDM believes the advantages of the additional documentation thus provided outweigh the cumbersomeness of the method. It should be noted that the index numbers referred to previously provide a key to the location of the variables in the COMMON areas of the COMBAT-II model and to their location on the output tape from the model.

D. PROCESSOR (COMII PROGRAM)

1. Inputs

As shown in Figure IV-2, there are four types of control cards and a description card which are used when running the COMII program: a version control card referred to as the MODEL card; a run control card, referred to as the CONTROL card, one or more run description cards, referred to as TITLE cards; an integration control card, referred to as the DEQ card; and one or more variable value modification cards, referred to as MODIFY cards. The CONTROL card, the MODEL card, and the DEQ card are required for all runs of the COMII porgram. The use of TITLE and MODIFY cards is optional, though the use of at least one TITLE card is recommended to help identify the run.

The MODEL card is always the first card in the input deck. The MODEL card determines whether the air model or the artillery model is being run. The format for the MODEL card is "AIR" in CC1-3 for the air model, and "ARTILLERY" in CC1-9 for the artillery model.

Information on the CONTROL card determines the mode of the run and permits the user to specify certain output options. The CONTROL card is always the second card in the deck and appears as follows: the word "CONTROL" in CC1-7; five logical (T or F values only) variables, RFLG, OFLG, DFLG, TFLG, and BFLG in CC11-15; and the game start time, TT in CC16-20.

If RFLG is true, then the program will operate in the creation mode. In a creation mode run only, the CONTROL card will be followed immediately by the NAMELIST deck produced by FORMS, with values punched in by the user. If BFLG is true, then the program will operate in the restart mode. If both RFLG and BFLG are false, the program will operate in the normal run mode. Note that RFLG and BFLG should never both be true.

The remaining flag variables provide output options. If OFLG is true, then a cross-reference listing in the same format as that produced by the FORMS program will be produced with the input coefficient values filled in. If TFLG is true, then a variable description listing is provided in the same format as in FORMS with the input values filled in. If DFLG is true, then a trace of the run is printed noting the game time, cumulative CPU time, and integration step size at certain integration points.

The game start time, TT, is the initial value for the simulation clock. In the restart mode, TT is the time from the previous run at which the run will be restarted.

The TITLE cards consist of from one to one hundred cards containing a description of the run. These cards have no format requirements other than they may not have the letters "DEQ" in CC1-3. The TITLE cards are written verbatim to the output tape.

The DEQ card provides the parameters which control the integration routine. The DEQ card begins with the letters "DEQ" in CC1-3 and contains six real numbers: the maximum integrator time interval, TINC, in CC11-20; the initial interval, which should be a negative power of two times the maximum interval, DELT, in CC21-30; a maximum allowable value for the error term computed by the integrator, ERROR, in CC31-40; an interval between

times in hours when the model stores its full set of state variables on output tapes, DTINER, in CC41-50; the end time for the run, TEND, in CC51-60; and the acquisition equation scale factor, ALPHA, in CC61-70. The complete set of state variables, also called a data point, should be stored at least ten times during the run, so DTINER should be at most one tenth of TEND.

The values of individual variables, both initially and during the simulation, are changed through the use of MODIFY cards. Each such card has "MODIFY" punched in CC1-6. A time in hours follows in CC11-20 to indicate the time at which the change is to take place. Up to four index/variable value pairs complete the data on the card. The first index appears in CC21-25, the first new value in CC26-35, and each successive pair occupies successive 15 card column fields to the right. The variable indices appearing on MODIFY cards are the index numbers appearing on the FORMS cross-reference list discussed earlier.

Additional index values are provided in the air model for altering the allocation of air resources (planes and their munitions) among forward and long-range bases. The valid indices for this function are -1 to -20 inclusive, and the new value is the fraction of available resources to be moved. A MODIFY card with index -1 moves the specified fraction of BLUE A1 (Interceptors) from BLUE long-range air bases to the forward air bases. The values -2 to -5 perform the same action for A2 (Fighter Bombers), A3 (Long-Range Bombers), A4 (Conventional Munitions), or A5 (Nuclear Munitions) respectively. Indices -6 to -10 cause movement of these same resources from BLUE forward to BLUE long-range bases. Reallocation on the RED side is accomplished using indices -11 to -20 in a similar fashion. For example, a card reading:

```
CC1234567890123456789012345678901234567890
  MODIFY    1200.     -12        .75
```

would cause 75% of RED fighter bombers on long-range bases to be moved to forward bases at time 1200.

The interval at which a data point is written to the output tape can also be changed using a MODIFY card. In the air model, any negative index of magnitude greater than 20 can force this change, and any negative index at all will have the same effect in the artillery model. In either case, the corresponding new value is the new data point interval.

2. File Unit Numbers

The processor uses several permanent files. TAPE1 is a normal run start file. TAPE2 is an output file used in the creation mode to store the initial data base for later use as a normal run start file. TAPE3 is the permanent output file in all modes. TAPE4 is used to initialize the model in restart mode. TAPE5 is the user data input file (i.e., the card reader). TAPE6 is the standard printed output file, and TAPE7 is the dictionary tape generated by FORMS.

3. Outputs

As indicated, the COMII program provides both printed and permanent file outputs. The permanent file contains the word "AIR" or the word "ARTILLERY" to identify the version of the model that generated the file. The title and start time of the run are recorded as well. The remainder of the file contains all of the data points recorded during the simulation run.

The printed output provides the user with a record of integration and modification activities occurring during the run. In addition to identifying the run with the version name, the title, and the control parameters from the CONTROL and DEQ cards, it lists all variables that were changed by MODIFY cards and the times of the changes. If DFLG on the CONTROL card is TRUE, a summary of the activities of the integrator is printed whenever variable values are modified or a data point is recorded. In addition, each time the integrator modifies the time step between integrations, the variable which caused the integrator time step to change, the number of cycles of integration since the last summary, and the cumulative CPU time of the simulation run are printed.

E. POSTPROCESSOR (ARTOUT AND AIROUT PROGRAMS)

1. Introduction

ARTOUT AND AIROUT are two independent postprocessor programs for the COMBAT-II model. ARTOUT is associated with the artillery version while AIROUT is used with the air version. The main purpose of these postprocessors is to extract the values of specific functional variable groups from the output file of the COMBAT-II program and print them in a tabular form. In addition, the totals of certain quantities are computed by these programs and tabulated in the same tables with their associated functional groups. A brief description of each entry is also provided. Detailed explanations of the interpretation of the tables in the postprocessor output are given in Chapter V.

ARTOUT and AIROUT differ only in certain formats and in the fact that ARTOUT provides for the output of information concerning the additional weapons systems modeled in the artillery version. Therefore, the following discussions will refer to both programs except where noted.

2. Inputs

The program requires the output file from the COMBAT-II program and a set of control cards detailing the desired output. There are two types of control cards, the CHANGE card which specifies the output of either actual values or of the rates of change of those values, and the TYPE card which specifies which tables are to be generated.

On each CHANGE card, the word "CHANGE" appears in CC1-6, and a positive or negative real number is found in CC11-15. The sign of the number is used to determine if the user wishes to see the actual values resulting from integrations or the rate of change of those values. If the number is positive, the actual values are presented. If the number is negative, then the rate of change is provided. A CHANGE card may appear at any point in the data stream. The effects of each CHANGE card persist until another CHANGE card is encountered. The default state is to print the actual values.

The TYPE card determines which set of tables the user receives. The TYPE card has the following format: the word "TYPE" in CC1-4; a three digit integer in CC5-7, termed the INTV number; a real number in CC11-15 referred to as TIME1; an alphanumeric field referred to as the TABLE parameter in CC16-17; and an integer number referred to as the SIDE parameter in CC18. A TYPE card is required for each table desired.

The INTV number provides the user with the option of varying the time interval between the data points presented in a table. All tables will present ten data points in ascending order by time. If no INTV number is present, the data points printed will be adjacent records on the tape. The user may, however, using the INTV number, select an alternate sequence. If the INTV number is 002, then every other data point will be selected until a total of 10 are selected. If the INTV number is 003 then every third data point will be selected until a total of 10 have been selected, and so on.

The TIME1 parameter gives the time of the first data point to be output. If a data point was not recorded at the time specified, the first data point recorded after that time will be used.

The TABLE parameter specifies the particular table which is to be output. The alphabetic character in CC16 determines the type of table, and the number in CC17 causes the table to be filled with data about a particular front or weapon system, whichever is appropriate. For example, the TABLE parameter A3 will produce an Aircraft Status table with information about type 3 aircraft.

With a few exceptions, the valid TABLE parameters are the same as the designators (A1, G1, W1, etc.) for the forces and weapon systems modeled in COMBAT-II. In the postprocessor, a TABLE parameter of R1, R2, or R3 provides a tabular output showing various aspects of FEBA movement at Fronts 1, 2, or 3 respectively. In addition, M0 gives both the M1 and M2 systems; B0 gives both the B1 and B2 systems; and finally, G0 gives the G3, G4, G5, and G6 systems (air version). Table IV-1 summarizes the valid table parameters.

Table IV-1. Table Parameters for AIROUT and ARTOUT

TABLE	TABLE PARAMETERS
GROUND FORCES	G1
SUPPLIES	G2
FRONTAL WEAPONS SYSTEMS AND MUNITIONS (ARTILLE	W1,W2,W3,W4,W5
FRONTAL WEAPONS SYSTEMS AND MUNITIONS (AIR)	G0
AIRBASES (ARTILLERY-B1 and B2 BASES)	B0
AIRBASES (AIR)	B1,B2
AIRCRAFT	A1,A2,A3
CENTRALLY CONTROLLED WEAONS SYSTEMS AND WARHEADS	M0
R FACTOR	R1,R2,R3

NOTE:

(A) G0 RESULTS IN BOTH THE G3/G5 AND G4/G6 SYSTEM TABLES BEING PRINTED BY AIROUT.

(B) B0 RESULTS IN BOTH THE B1 AND B2 SYSTEM TABLES BEING PRINTED BY ARTOUT.

(C) M0 RESULTS IN BOTH THE M1 AND M2 SYSTEM TABLES BEING PRINTED BY BOTH AIROUT AND ARTOUT.

(D) THE Wi TABLES INCLUDE THE ROUNDS ASSOCIATED WITH EACH WEAPON SYSTEM.

(E) SITE INFORMATION IS INCLUDED WITH THE SPECIFIC MUNITION/WEAPON SYSTEMS.

3. File Unit Numbers

TAPE3, TAPE5, and TAPE6 are the files used by these postprocessor routines. TAPE3 provides the data values from the processor as input, while TAPE5 accepts all control inputs. TAPE6 is the printed output file for both ARTOUT and AIROUT.

4. Outputs

The tabular output of AIROUT and ARTOUT will be discussed in Chapter V.

F. POSTPROCESSOR (GRAPHC2 PROGRAM)

1. Inputs

The GRAPHC2 program generates printer plots of user selected variables from the COMBAT-II output tape. Three types of control cards are required: a TITLE card which gives the title for a particular plot; an INDEX card specifying the variables to be plotted; and a TLIMIT card, specifying the time span for the graphs.

The use of the TLIMIT card is optional. It may be used to specify the time span over which variable plots are desired. The default time span is the entire time span on the output tape. If the TLIMIT option is exercised, then the TLIMIT card appears as the first card, and has the following format: the word "TLIMIT" in CC1-6; a real number specifying the lower end of the plotted time span in CC11-20; and a real number specifying the upper end of the time span in CC21-30. Note that if the TLIMIT option is used, the time span is set for the entire run of GRAPHC2, and may not be changed again by the use of additional TLIMIT cards.

The TITLE card is used in conjunction with the INDEX card. The TITLE card is printed verbatim as the title of the plot and has no format or key words associated with it.

The TITLE card is immediately succeeded by its associated INDEX card. The INDEX card specifies from one to fourteen variables to be plotted

over time on the same graph. The INDEX card uses the integer variable indices from the cross-reference listing generated by FORMS to determine which variables are to be plotted. An INDEX card may contain identifying information in CC1-10. The index numbers are right justified integers within five character fields for the remainder of the card. Thus, the first index appears in CC11-15, the second in CC16-20, the third in CC21-25, and so on to CC80. The program stops reading indices from that card upon encountering the first zero or blank index field.

For those values that are the results of integrations, the actual value is plotted. If a minus sign is placed before the variable index number on the INDEX card, the rate of change of that variable will be plotted also. The order of appearance of the card input is illustrated in Figure IV-6.

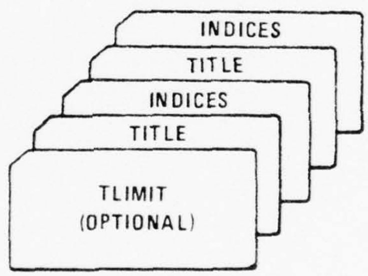


Figure IV-6. GRAPHC 2 Input Deck

2. File Unit Numbers

As in ARTOUT and AIROUT, TAPE3 provides initial values and TAPE5 all control inputs for GRAPHC2. TAPE4 is used to output all nongraphic information, errors, data, etc., from this module, while TAPE6 is the permanent file for the plots generated. The plots are not written directly to system output. The user may either copy them to the output file using Job Control Language (see example, Appendix C) or catalog TAPE6 for later access.

3. Outputs

The outputs are a table of contents of the graphs resulting from a run, the graphs themselves, and a list of the data points used to generate each graph. The table of contents prints the user supplied graph title and the page number of the printout where that graph occurs. In addition, the indices of the variables appearing on that plot are listed.

The graph itself appears with time as the X axis and the data values as the Y axis. The Y axis scale is derived from the maximum and minimum values of the variables to be plotted. The spacing between steps will in no case, however, be less than five units. The first index value is plotted using the letter A, the second using the letter B, and so on. Intersections of curves will show the last letter plotted. That is, if two variables are plotted on the same graph and they intersect, then a B will be found at each point of intersection.

The listing of the data used to generate the graph appears with the time of the data point at the left margin. The plotted values at that time appear on the same line. The listing immediately succeeds the plot of the data and is paginated.

G. OPERATING NOTES

In developing the COMBAT-II system, certain operating procedures and parameter values have been identified as providing the most satisfactory results in terms of the realism and reliability of the model.

(1) The computer core should always be cleared before programs are loaded. This is accomplished by including "LDSET,PRESET=ZERO" as a command in the Job Control Language for any run (see Appendix C).

(2) The most realistic FEBA movements were achieved when the FEBA Shaping Factor, referred to in Chapter II, (variable C0601X) was assigned the value .489.

(3) Integration is performed using a Runge-Kutta algorithm as a driver to provide initial inputs to an Adams-Moulton Predictor/Corrector algorithm. The integration routine examines the predicted error which will result from an integration and may either halve or double the time step size, delta t, depending on the magnitude of this error. The integration routine was found to operate most successfuly given the following input parameters on the DEQ card.

(a) TINC, CC11-20 1.0

(b) ERROR, CC31-40, .01

(c) ALPHA, CC61-70, .1

CHAPTER V
OUTPUT/ANALYSIS

A. INTRODUCTION

The purpose of this chapter is to familiarize the user with the types of output that can be requested and to depict some examples of how this data can be used in an analysis. Before discussing these two areas, a description of how an analysis using COMBAT-II should be conducted is in order.

COMBAT-II provides a flexible tool for the analysis of conflict situations in a wide range of study contexts. Much of the model's flexibility is derived from the fact that all of the values used in the COMBAT-II computations are under user control, both initially and during the simulation run. The generation of a set of variable values which properly represent the situation to be studied is a stage in the use of COMBAT-II which must not be neglected.

The analyst must perform preliminary analysis to develop a plan for the study which identifies the variables which will be modified, the times of modification, the sequence in which these modifications are to be applied to the simulation, and the initial and bounding conditions within which the study will take place. The user must always keep in mind that COMBAT-II is a highly coupled model and changes made in one value will usually require corresponding changes in other values.

To illustrate the range of problems that COMBAT-II may address, consider the following three problems:

(1) What is the impact of targeting 2nd Echelon Armies, in both conventional and nuclear modes, in a European conflict?

(2) What is the most satisfactory nuclear artillery round stockpile level for use in a limited tactical nuclear mode?

(3) What are the implications of removing the nuclear 155 mm round currently deployed in Europe?

COMBAT-II can be used to gain some insights into all three questions. However, each question must be approached in a slightly different way if the maximum effectiveness of the model is to be achieved.

1. Question 1

In order to assess the impact of targeting 2nd Echelon Armies by long range weapons, these forces must be isolated from 1st Echelon Armies. COMBAT-II does not keep track of forces by unit affiliation, and attrition is assessed uniformly to all forces in a front or the rear. Isolation is effected by supplying the appropriate initial input variable values representing the 2nd Echelon Armies as being in the "REAR" area. Figure V-1 provides a schematic representation of this scenario.

2. Question 2

Studying this question involves an analysis of artillery effectiveness when nuclear weapons are to be used only against 1st Echelon Divisions. Again the isolation of a particular type of unit is required, and in this case input values are chosen to place both 2nd Echelon Divisions and 2nd Echelon Armies in the "REAR" area, out of artillery range. Figure V-2 depicts this arrangement.

3. Question 3

Initially this question appears to be quite similar to the second problem. It has been included to illustrate that a thorough analysis of the problem should always include a consideration of how the model treats the input data. COMBAT-II treats the weapon systems available in a particular front in a homogeneous manner, i.e. they are spread evenly across the entire front by type. This is acceptable as long as combat capability differentiations between corps in a front are not required. In this case however, the fact that the national components which make up the NATO forces have differing nuclear capable systems has a direct impact on the results of the COMBAT-II analysis.

The real question which must be addressed is whether or not there remains sufficient nuclear capability to meet an enemy threat after the removal of the 155mm round. In such an instance, care must be taken to ensure that each corps within a front has similar nuclear capabilities, since

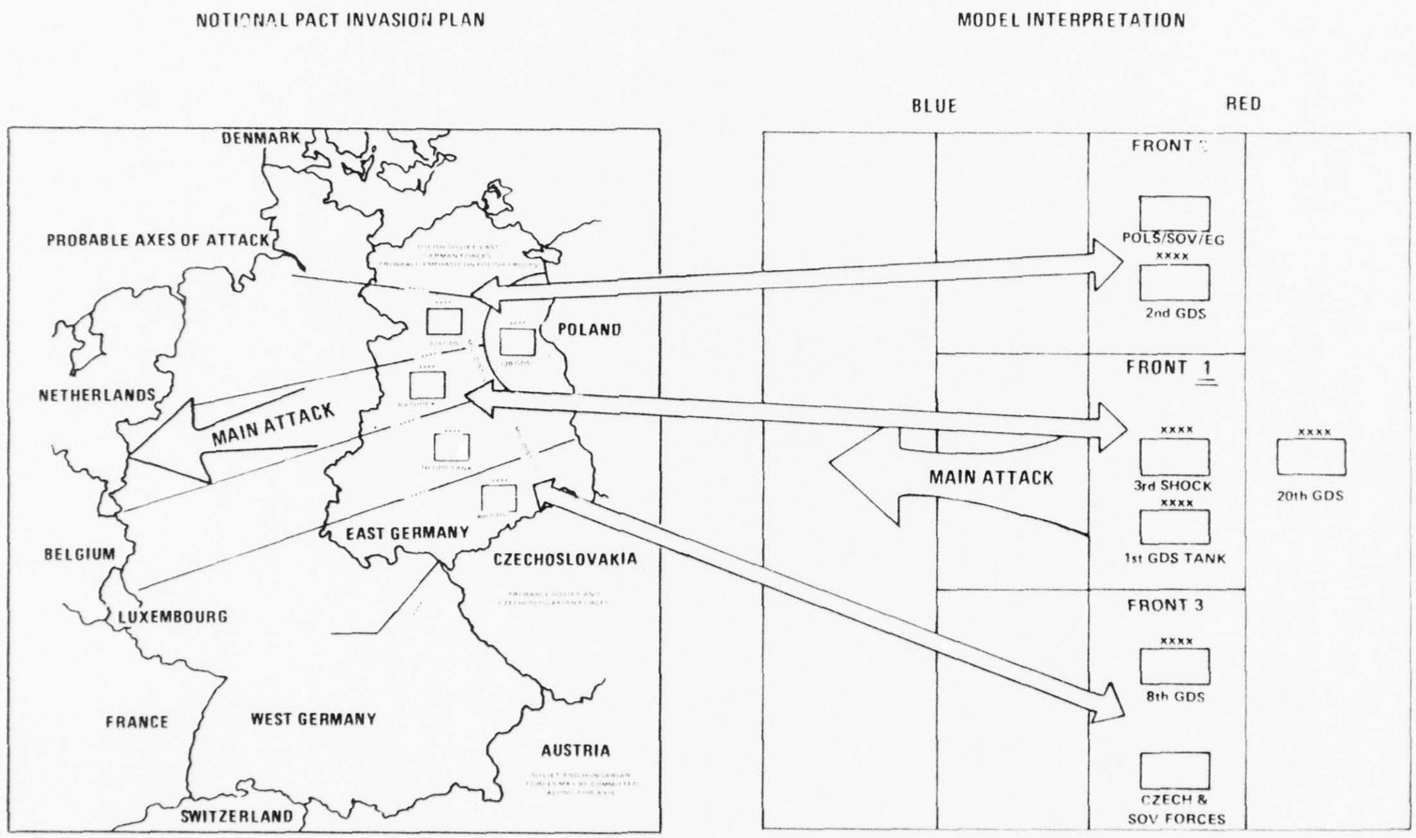


Figure V-1. Isolation of Second Echelon Armies

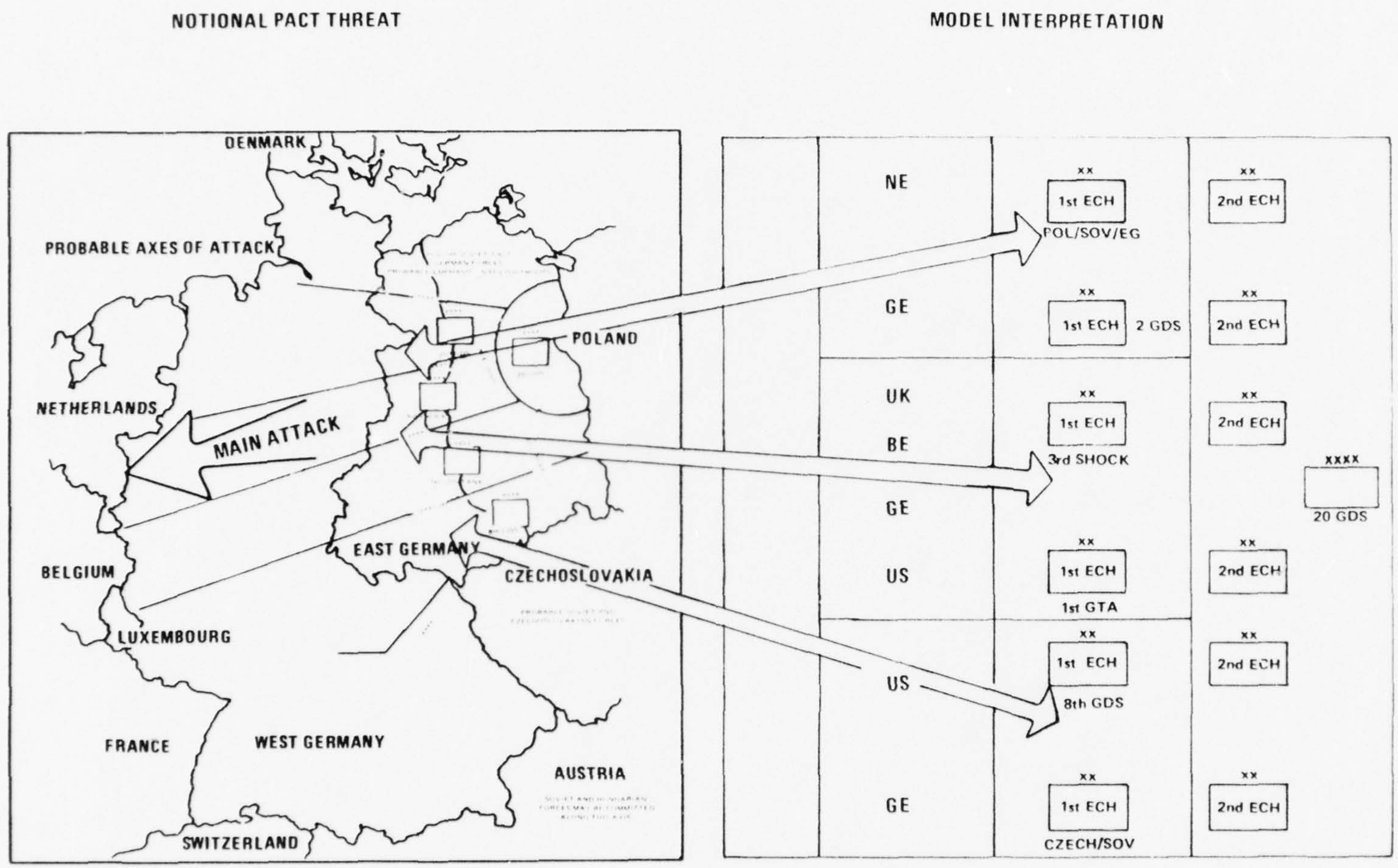


Figure V-2. Isolation of First Echelon Divisions

COMBAT-II will distribute these nuclear capabilities uniformly over the front, thereby masking possible deficiencies in nuclear capability.

Preliminary analysis will reveal that certain national components of NATO have fewer nuclear assets than others. Therefore, input data must be developed which represents the dissimilar nuclear capabilities of the NATO component forces as being in different fronts to permit the effects of those variations in unit capabilities to be observed. Figure V-3 depicts a possible arrangement of forces within COMBAT-II fronts which segregates the NATO corps by nuclear capability.

B. OUTPUT

Two types of output can be requested: integrated values and the rates of change of those values. Normally, the integrated values are the preferred type of output, though rates of change may react more dramatically to certain events in the course of a run and thereby provide stronger indications of the effects of certain actions.

As indicated in Chapter IV the inputs to the postprocessor enable the user to print any subset of the following tables:

(1) R Factor

(2) G1 - Ground Force Status

(3) W1 through W5 (for ARTILLERY) - Frontal Weapon System Status

(4) G3 - G4 (for AIR) - Frontal Weapon System Status

(5) M1 - M2 - Central Missile Systems

(6) B - Air Base Status

(7) A1 through A3 - Aircraft Status

(8) G2 - Supply Status

Tables may be printed for either or both sides, and may contain either variable values, or their rates of change. Except for the R Factor Tables the table titles have a standard format. As an example:

SYSTEM G1 BLUE DATA

is the title of the BLUE Ground Force Status Table. The R Factor Tables

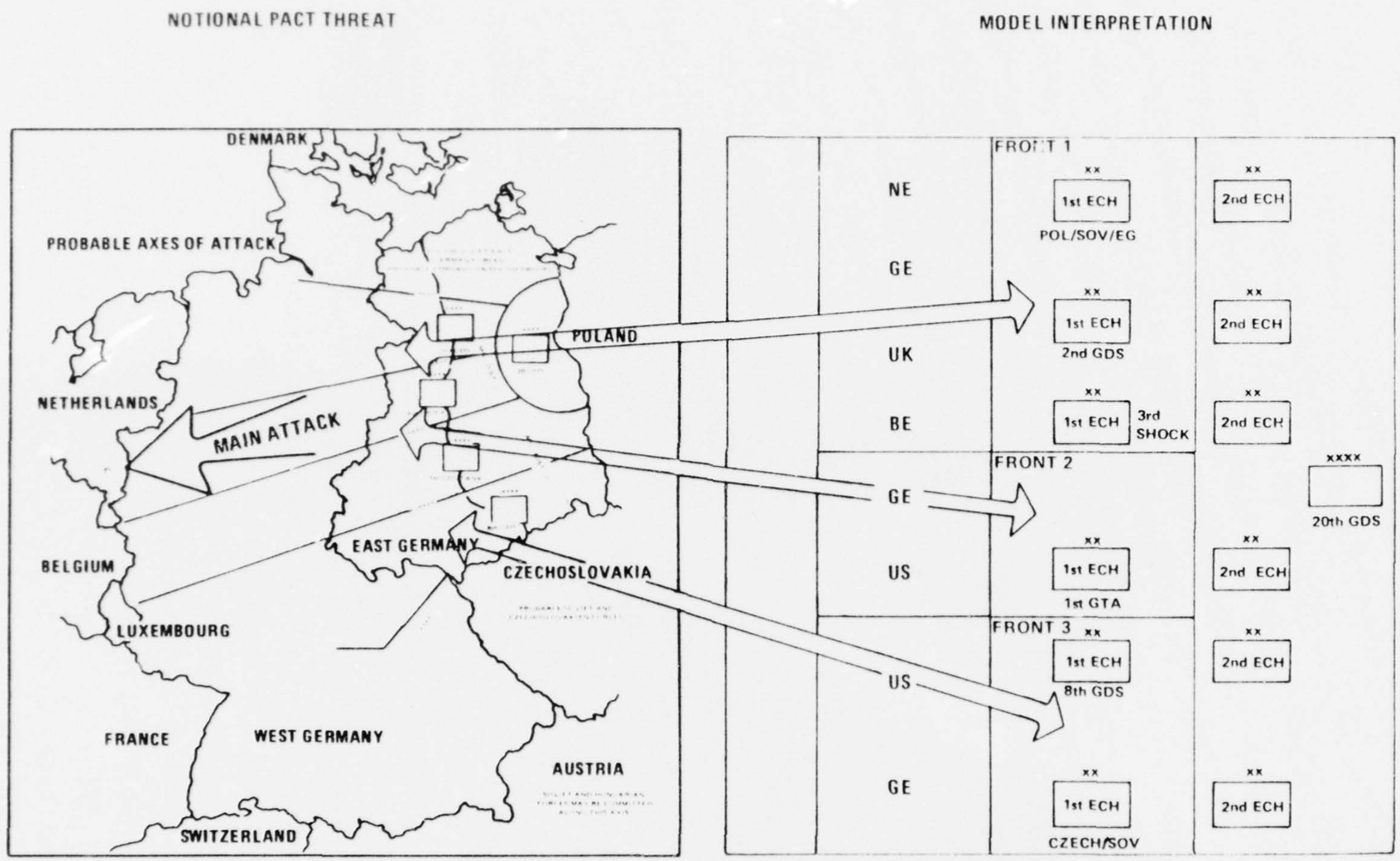


Figure V-3. Isolation of 155mm Nuclear Capability

have titles indicating the front for which data is being presented, e.g.:

R FACTOR AT FRONT 3   BLUE DATA

In the description of these tables below, it is assumed that they contain values rather than rates except where rates always appear.

1. R Factor

The R Factor Tables are nearly identical for RED and BLUE. There are three tables for each side, one for each front. An R Factor Table contains the total ground force attrition rate and a breakdown of the systems which contributed to that attrition for both sides, as well as a total number of ground forces in the front for both sides. On a BLUE R Factor Table the numbers which apply to RED G1's have "+" in their labels (e.g., TOTAL +G1 LOSS is the total loss rate of RED G1's when it appears on a BLUE R Factor Table and vice versa). In addition the steps made in calculating the r factor, are explicitly shown at the bottom of the table.

2. G1 - Ground Force Status

There is one Ground Force Status Table for each side. It contains the total numbers of forces in the three fronts and the rear, the attrition on those forces broken down by those four areas, external resupply, and forces moved from the rear to the various fronts. This section is followed by a tabulation of the FEBA position and movement rate by front and then a section displaying the frontal and rear attrition broken down by causal system. A subtable summarizing the reinforcement supply and demand, a complete central command system table of available enemy targets, and acquired enemy targets given by weapon system and front concludes this table.

3. W1 - W5 (for ARTILLERY) - Frontal Weapon System Status

Each Frontal Weapon System Table is divided into two similar sections. The first presents the total number of that type of weapon system by front, as well as demand for and supply of replacements for losses. External resupply appears also, followed by a complete summary of attrition by front and enemy weapon system causing the attrition. The second section contains almost identical information about the rounds for that frontal weapon system, except that attrition of rounds is always associated attrition, and is not kept according to the cause of the attrition. Also, a list is presented of the target types, by front, against which the rounds were fired.

4. <u>G3 - G4 (for AIR) - Frontal Weapon System Status</u>

The above paragraph applies to these air version equivalents of W1 and W2. The corresponding rounds are G5 and G6 rather than R1 and R2.

5. <u>M1 - M2 - Central Missile Systems Status</u>

Each of these tables contain the status information about a missile type, launchers for that missile, and nuclear storage sites. Current totals, losses, and resupply are given, as well as the number of missiles per launcher and per site. A listing of the number of missiles launched against the various target types in the three fronts and the rear follows, and a summary of the causes of missile, launcher, and site attrition completes the table. When nuclear release has taken place, the portion of the table showing the status of munitions has proven to be exceptionally useful in determining the causes of various outcomes.

6. <u>B - Air Base Status</u>

A single Air Base Status Table for each side displays information about forward and rear air bases and air munitions loads. For each type of base, the total number of bases is given as well as the number of each type of aircraft per base. The percentage of unrepaired base damage, an air base efficiency degradation factor and launch rate degradation by aircraft type appear as well. The munitions section includes the current inventory of both nuclear and conventional loads in addition to numbers used, lost on the ground, and resupplied from external sources. A record of the number of hours when nuclear loads were used is also provided.

The air version of COMBAT-II permits greater resolution of the air battle than the artillery version. Two launch rates may be input, one for the B1 bases and one for the B2 bases. Thus, the actual launch rates can vary by air base type and aircraft type. In addition, conventional and nuclear munition loads are allotted by air base type. A specific number of aircraft are assigned to each air base type. Aircraft launched from one type of base always return to that type. In contrast, the artillery version of COMBAT-II continually reassigns returning aircraft to B1 or B2 bases in accordance with an initial percentage input.

7. A1 - A3 - Aircraft Status

The Aircraft Status Tables have an appearance similar to the Frontal Weapon Systems Status Tables. There is a separate table for each aircraft type. It contains the current number of aircraft, the number lost, and the number resupplied. A section for the air battle follows, indicating the number launched in air-to-air and air-to-ground roles and the losses to enemy air-to-air. The sorties carried out by survivors of the air battle against targets in the fronts and rear are then listed by target type. A summary of losses both to air defenses in the fronts and rear by target type, and to attack on airbases by enemy aircraft or missiles is provided as well. The "+" sign appears on this table too, and again has the meaning of "opposite side," e.g., on a BLUE A3 table, "AG LOSSES DUE TO +AA" means BLUE A3 in air-to-ground role lost to RED air-to-air. Whenever an aircraft type is not used in an air-to-ground role its launch rate in that role will be stored as zero. This suppresses the printing of data on targets attacked and losses to area or point defenses, since these would be irrelevant.

8. G2 - Supply Status

The Supply Status Table begins with a summary, by front and the rear area, of the total amount of available supplies, the total amount of supplies expended or lost, the fraction of the losses which are to be replaced, the cumulative totals of supplies moved from the rear to the fronts, and the amount of external supply. This summary is followed by a breakdown of the causes of supply loss by front and rear area. The amounts of supplies consumed and the losses of supplies due to associated ground force attrition is presented by front. Finally, a recapitulation of the supply demand by front and the movement of supplies in response to those demands is presented.

C. ANALYSIS

In the remainder of this Chapter, example results of conflicts simulated by COMBAT-II will be presented. The situations that will be depicted are taken from a variety of COMBAT-II runs. Some are from actual analyses

and some are derived from situations contrived to test the model. They are presented to illustrate the array of insights that may be gained in utilizing the COMBAT-II model.

1. Situation 1

In the first situation, a fully-mobilized Side 1 force attacks an inferior force on Side 2. The forces are arrayed in three fronts with both sides giving priority to the attack or defense of Front 1. Side 1 is constrained by supplies and logistic capabilities, whereas Side 2 is constrained by inadequate reserve forces. Both sides use only conventional weapons, and the conflict terminates when Side 1 exhausts its supplies.

An aggregate measure of the outcome of a theater conflict is a trace of the FEBA position. COMBAT-II provides such an index for each of the three fronts. Figure V-4a details the ground gained by Side 1. Side 1's movement objectives for the three fronts are weighted towards Front 1 followed by Front 3. Side 2 defends with priority given to Front 1.

A more detailed examination of the rate of movement of the FEBA at Front 1, Figure V-4b, gives a better picture of the effects of resource constraints. Side 2 slowed the rate of advance by deploying reserves to Front 1. These reserves, however, were eventually exhausted. Side 1 was unable to mass sufficient forces to overwhelm Side 2 before it ran out of supplies; the attack then ground to a halt. Here the rate of FEBA movement was more sensitive to changing combat conditions than the actual FEBA movement. The commitment of Side 2 reserves did slow the advance of Side 1, but not completely. Side 1's running out of supplies made his rate of advance drop off to zero, but only after he had advanced well into Side 2 territory. Because the rate of advance was never large, these changes did not create bulges in the FEBA trace.

2. Situation 2

Having examined how COMBAT-II plays a conventiol war, this situation shows how nuclear systems affect a theater conflict. In particular, it illustrates how variables such as weapon inventories, acquisition factors, weapon allocations, and expenditure rates interact to affect the overall outcome of a theater tactical nuclear war.

This situation utilizes roughly numerically equal forces which are smaller in size than those in Situation 1. Side 1 initially preempts with its full array of tactical nuclear weapons and theater-allocated air forces. Side 2 responds in kind one hour after the attack. The advantage alternates between Side 1 and Side 2 while nuclear inventories last, but shifts to Side 1 after Side 2 nuclear systems are exhausted.

Part of the benefit which may be derived from the COMBAT-II model is the ability to determine the causes of changes in the slope of the curves. This sample nuclear conflict highlights important sensitivities, some of which will be examined further in the next situation.

A trace of the FEBA movement at Front 1 during the early stages of conflict, Figure V-5a, shows the effect of the Side 1 preemptive attack and the massive response by Side 2. Side 2 forces are initially pushed back while they are still in a conventional posture. After 1 hour, Side 2 responds with its nuclear systems, recovers the lost territory and drives into Side 1 territory until the nuclear systems are exhausted.

The alternation of movement shown in Figure V-5a, is due to the application and subsequent exhaustion of nuclear system resources. Ground force numbers are relatively stable, because casualties are being replaced by resupply from the rear. In Figure V-5b, each of the four components of the r factor which produced the movement shown in Figure V-5a is presented. Variations in Side 1 forces and the rate of attrition of those forces are represented with solid lines. The values from all four of these curves are necessary for computation of the r factor and the movement of the FEBA (see Chapter II, Section B). One can see the dramatic increase in the rate of attrition to Side 1 after Side 2 nuclear release occurs, and the subsequent decrease in the attrition rate to Side 1 when Side 2 nuclear systems are exhausted.

3. Situation 3

Having highlighted some of the outputs revealed during the course of simulating a conventional and a nuclear conflict, this situation presents an example of how sensitivities may be examined using COMBAT-II. The first two

situations served to demonstrate COMBAT-II operations. The following are excursions from a conventional conflict run of COMBAT-II to illustrate the model's ability to test nuclear force options and relative contributions of nuclear weapon systems in a theater context.

The variation of force application affords insights into the doctrine of selected nuclear release (Figure V-6a). In these excursions, the two sides released sets of similar nuclear systems after a certain point in the conventional conflict. This figure shows that W1 type weapons, when employed by both sides, provide Side 1 a greater advantage than Side 2. This was due to larger numbers in this case, but the outcome could have been caused by differences in weapon system qualities.

When both sides employ their W1 and W2 weapon systems, the advantage returns to Side 2. Note that when Side 2 employs W1, W2, and W3 systems, it does not exhibit the same advance as with the W1 and W2 systems. This implies that Side 1 incurs some advantage from the use of its W3 weapons system, although in this instance the advantage was insufficient to drive the FEBA into Side 2 territory. When all means of nuclear delivery are employed, aircraft and central missile systems, as well as frontal weapon systems, Side 1 is able to force the conflict into Side 2 territory.

COMBAT-II can also assist in resolving arguments about quantity versus quality. Shown in Figure V-6b is the operation of a current tactical system compared with hypothetical future deployments. A sevenfold increase in the number of systems deployed has relatively little impact on the conflict, given prevailing operational constraints. Coupled with an improved single-shot probability of kill, however, the increased numbers have a dramatic impact on redressing a theater imbalance.

The variation of system and force parameters in a theater model can be a powerful tool for study of the design and acquisition requirements for new weapon systems.

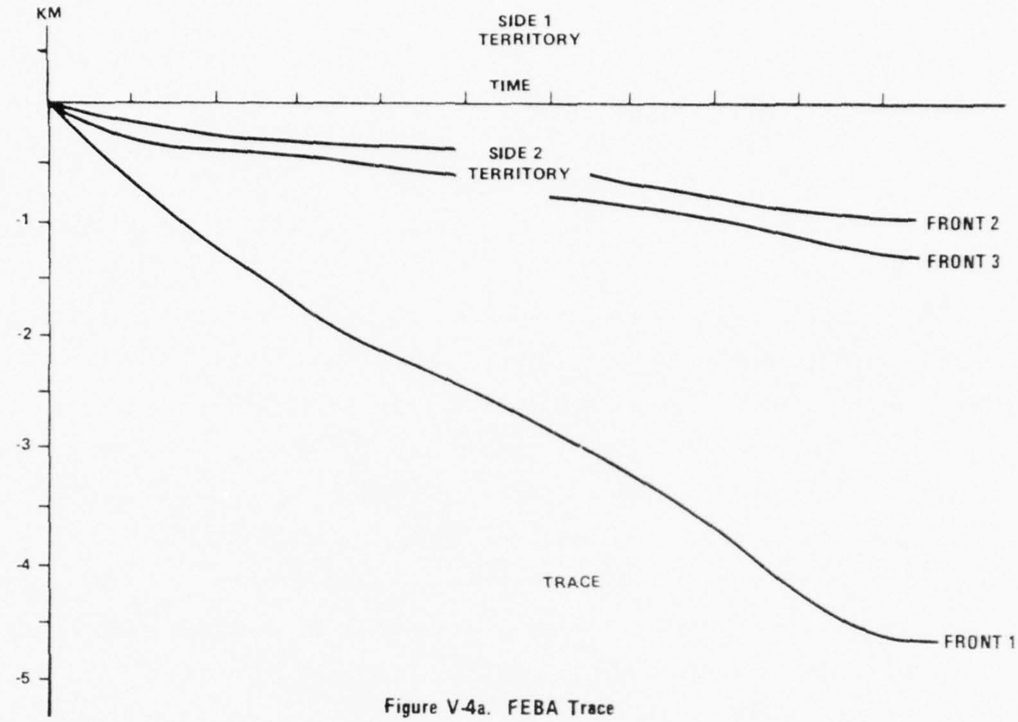


Figure V-4a. FEBA Trace

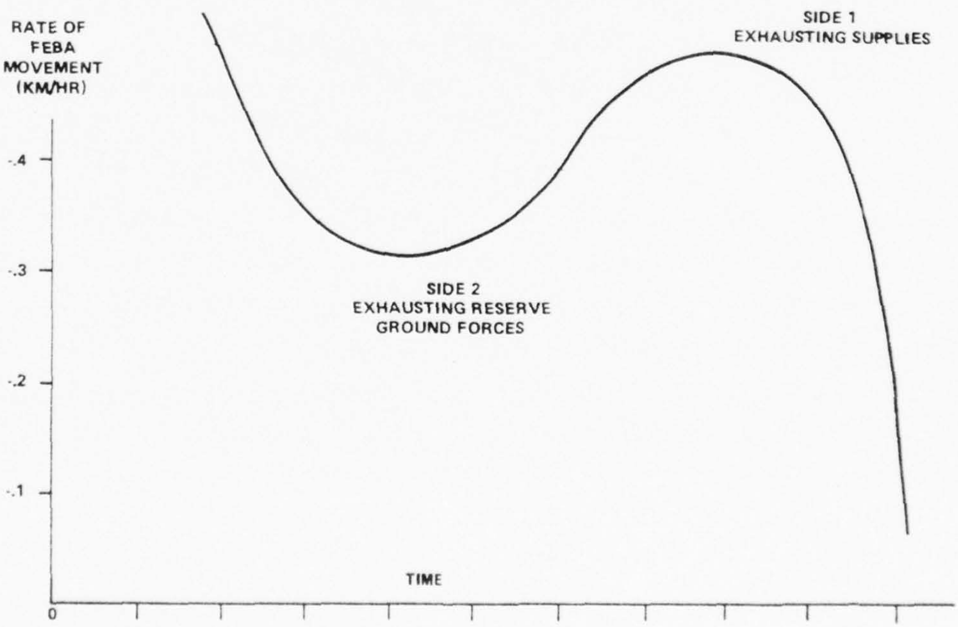


Figure V-4b. Rate of FEBA Movement

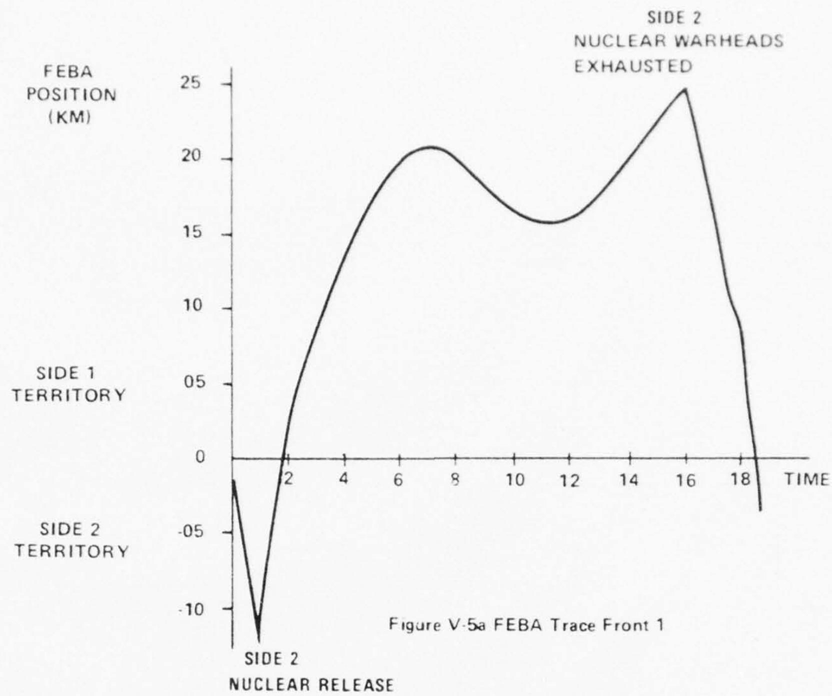


Figure V-5a FEBA Trace Front 1

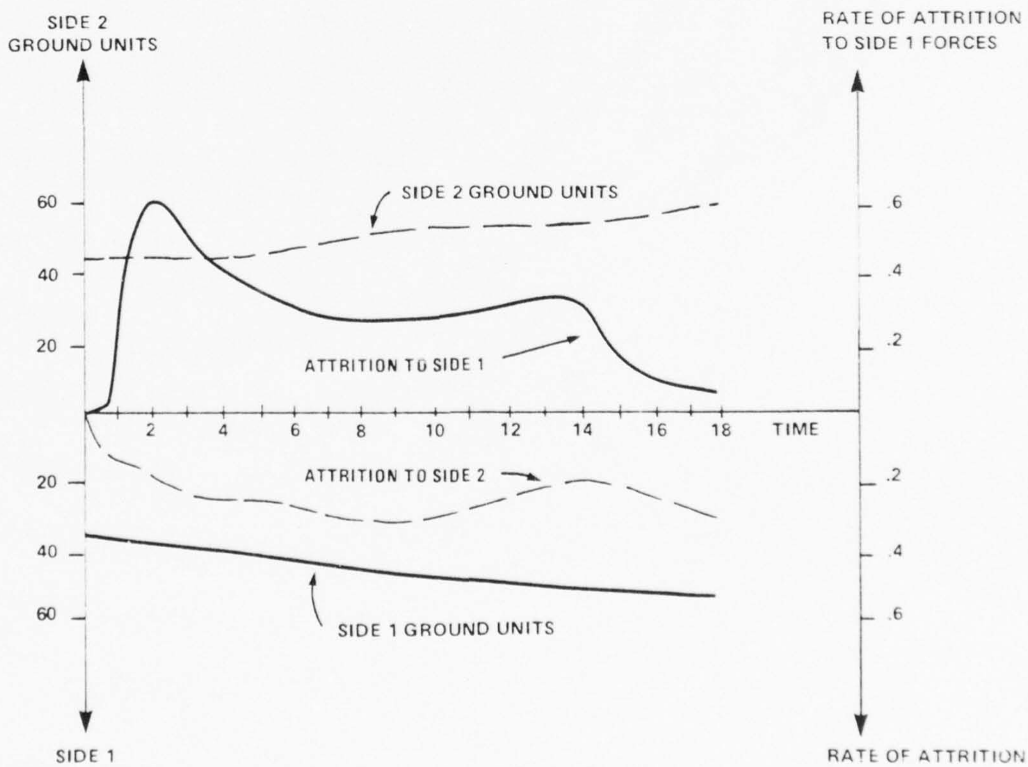


Figure V-5b Decomposition of Combat Capability

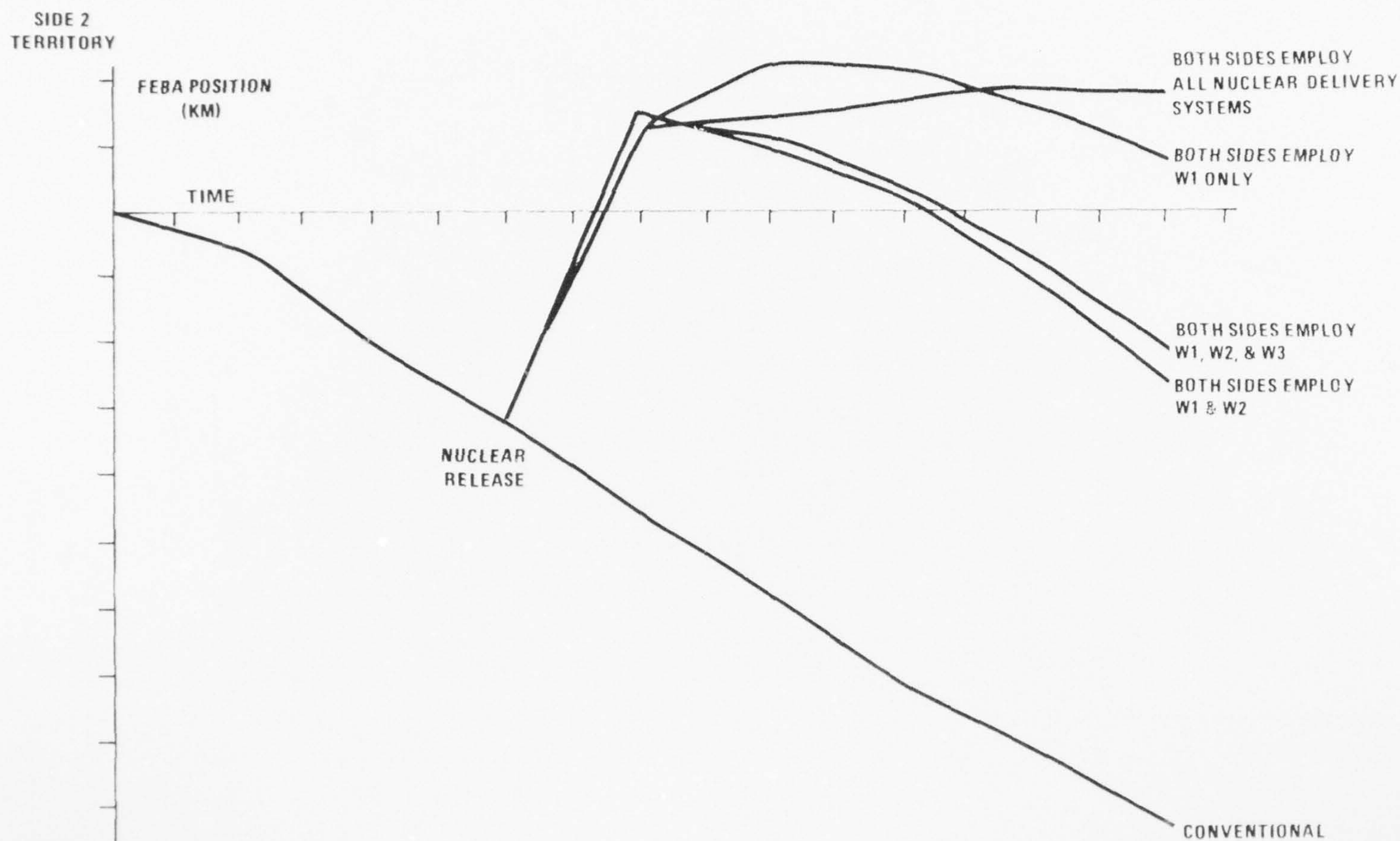


Figure V-6a. Variation of Force Application

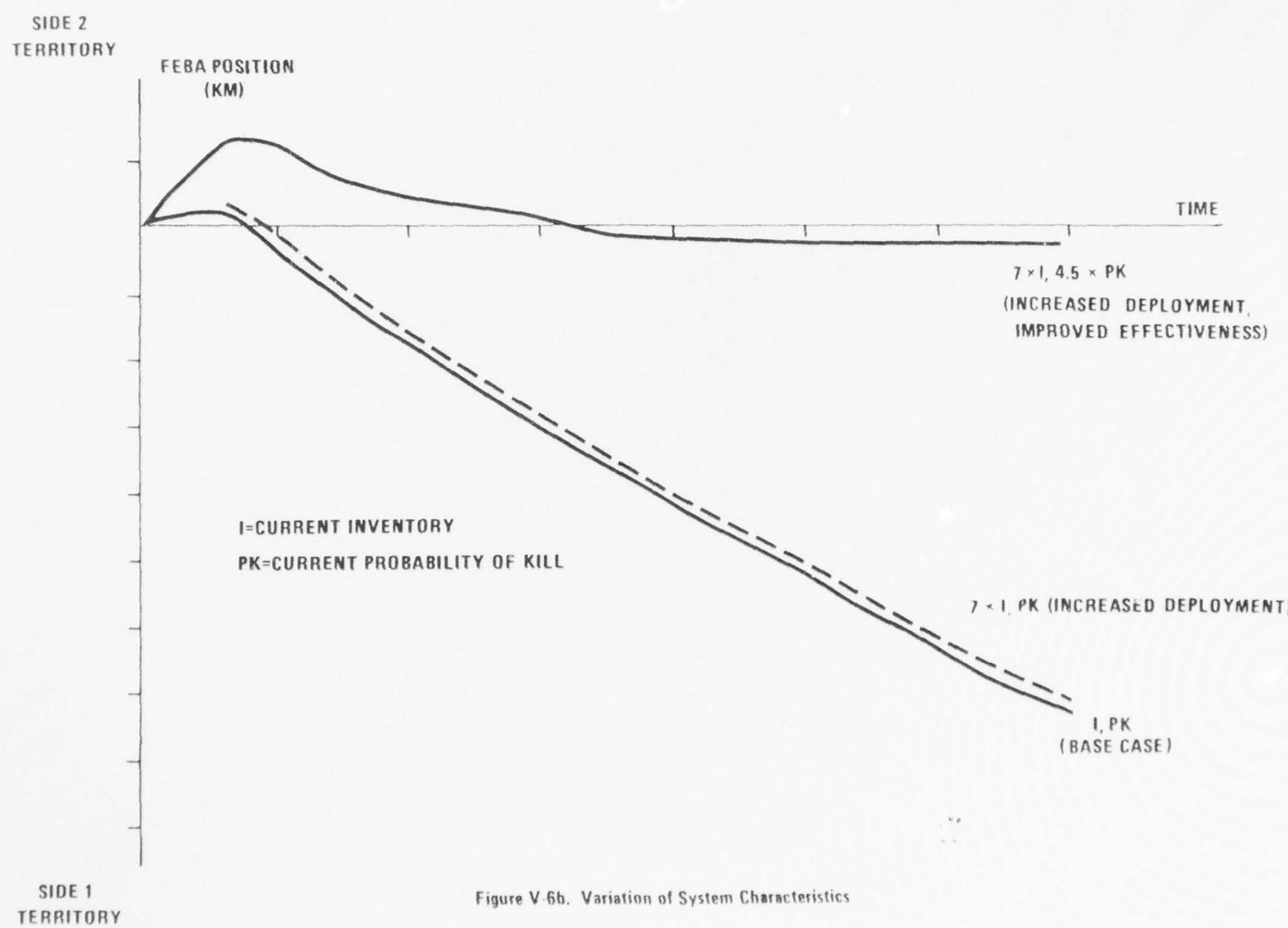


Figure V-6b. Variation of System Characteristics

APPENDIX A

COMBAT-II - DICTIONARY AND TABLE INPUT

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AIR DICTIONARY DECK

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C0010X (IB)           PERCENT KNOWLEDGE INITIAL OF G1F
C0020X (IB)           PERCENT KNOWLEDGE INITIAL OF G2F
C0030X (IB)           PERCENT KNOWLEDGE INITIAL OF G1R
C0040X (IB)           PERCENT KNOWLEDGE INITIAL OF G2R
C0050X (LL,IB)        PERCENT KNOWLEDGE INITIAL OF L(L)
C0060X (KW,IB)        PERCENT KNOWLEDGE INITIAL OF W(K)F
C0070X (KW,IB)        PERCENT KNOWLEDGE INITIAL OF W(K)R
C0211X (JA,IB)        RANGE FRACTION FOR A(J)G AGAINST G1F
C0212X (JA,IB)        RANGE FRACTION FOR A(J)G AGAINST G2F
C0213X (JA,IB)        RANGE FRACTION FOR A(J)G AGAINST G1R
C0214X (JA,IB)        RANGE FRACTION FOR A(J)G AGAINST G2R
C0215X (JA,LL,IB)     RANGE FRACTION FOR A(J)G AGAINST L(L)
C0216X (JA,KW,IB)     RANGE FRACTION FOR A(J)G AGAINST W(K)F
C0217X (JA,KW,IB)     RANGE FRACTION FOR A(J)G AGAINST W(K)R
C0231X (LL,IB)        RANGE FRACTION FOR L(L)  AGAINST G1F
C0232X (LL,IB)        RANGE FRACTION FOR L(L)  AGAINST G2F
C0233X (LL,IB)        RANGE FRACTION FOR L(L)  AGAINST G1R
C0234X (LL,IB)        RANGE FRACTION FOR L(L)  AGAINST G2R
C0235X (LL,KL,IB)     RANGE FRACTION FOR L(L)  AGAINST L(K)
C0236X (LL,KW,IB)     RANGE FRACTION FOR L(L) AGAINST W(K)F
C0237X (LL,KW,IB)     RANGE FRACTION FOR L(L) AGAINST W(K)R
C0242X (KW,IB)        RANGE FRACTION FOR W(K)F AGAINST G1F
C0243X (KW,IB)        RANGE FRACTION FOR W(K)F AGAINST G2F
C0244X (KW,JW,IB)     RANGE FRACTION FOR W(K)F AGAINST W(J)F
C0251X (IB)           FLOW OF G1F  INTO NA
C0252X (IB)           FLOW OF G2F  INTO NA
C0253X (IB)           FLOW OF G1R  INTO NA
C0254X (IB)           FLOW OF G2R  INTO NA
C0255X (LL,IB)        FLOW OF L(L) INTO NA
C0256X (KW,IB)        FLOW OF W(K)F INTO NA
C0257X (KW,IB)        FLOW OF W(K)R INTO NA
C0261X (IB)           FLOW OF G1F  OUT OF NA
C0262X (IB)           FLOW OF G2F  OUT OF NA
C0263X (IB)           FLOW OF G1R  OUT OF NA
C0264X (IB)           FLOW OF G2R  OUT OF NA
C0265X (LL,IB)        FLOW OF L(L) OUT OF NA
C0266X (KW,IB)        FLOW OF W(K)F OUT OF NA
C0267X (KW,IB)        FLOW OF W(K)R OUT OF NA
C0307X (MB,NK,IB)     COUPLING COEF - B(M) ATTACKS TO A/C LAUNCH DEG. FACTOR
C0511X (IB)           COUPLING COEF. - A4 LOSSES TO AB(1) LOSSES
C0512X (NK,IB)        COUPLING COEFF. - A4/A5 LOSSES TO AB(2) LOSSES
C0513X (NK,IB)        COUPLING COEFF. - A4/A5 LOSSES TO AB(3) LOSSES
C0521X (IB)           COUPLING COEFF. - G2 LOSSES TO G1 LOSSES
C0522X (IB)           MAXIMUM DESIRABLE G2 PER G1F
C0523X (KW,IB)        MAXIMUM W(K) PER G1
C0601X                SHAPING FACTOR FOR FEBA MOVEMENT
C0603X (IF,IB)        COUPLING COEF. - G1F(I) ATTRITION LOSSES TO G1F(I) DEMAND
C0604X (IB)           DEMAND SCALE FACTOR
C0605X (IB)           DEMAND RESPONSE UNIT CONVERSION FACTOR
C0606X (IB)           NUMBER OF G2 UNITS PER G1 UNIT
C0607X (IB)           PORTION OF G2 EXPENDITURES AND LOSSES TO BE REPLACED
C0610X (KR,IB)        MAXIMUM R(K) PER W(K)
C0611X (KW,IB)        PORTION OF W(K)F LOSSES TO BE REPLACED
C0612X (KR,IB)        PORTION OF R(K)F LOSSES AND EXPENDITURES TO BE REPLACED

E0511X (IB)           EXPENDITURE RATE OF A4 PER AA
E0512X (IB)           EXPENDITURE RATE OF A4 PER AG(1)
E0513X (NK,IB)        EXPENDITURE RATE OF A4/A5 PER AG(2)
E0514X (NK,IB)        EXPENDITURE RATE OF A4/A5 PER AG(3)
E0521X (IB)           EXPENDITURE RATE OF G2 PER G1
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F0106X	(JA,IB)	FRACTION OF AR(J) ALLOCATED TO S
F0107X	(JA,LL,IB)	FRACTION OF AR(J) ALLOCATED TO L(L)
F0108X	(JA,MB,IB)	FRACTION OF AR(J) ALLOCATED TO B(M)
F0109X	(IB)	FRACTION OF AREA AIR DEFENSE SEEN BY -EA- ATTACKE-
F0201X	(JA,IF,IB)	FRACTION OF A(J)F(I) ASSIGNED TO G1F(I)
F0202X	(JA,IF,IB)	FRACTION OF A(J)F(I) ASSIGNED TO G2F(I)
F0301X	(LL,IB)	FRACTION OF L(L) ALLOCATED TO FRONT
F0302X	(LL,IF,IB)	FRACTION OF L(L)F ALLOCATED TO F(+)
F0303X	(LL,IF,IB)	FRACTION OF L(L)F(I) ALLOCATED TO G1F(I)
F0304X	(LL,IB)	FRACTION OF L(L)R ALLOCATED TO G1R
F0305X	(LL,IB)	FRACTION OF L(L)R ALLOCATED TO G2R
F0306X	(LL,KL,IB)	FRACTION OF L(L)R ALLOCATED TO L(K)
F0307X	(LL,IB)	FRACTION OF L(L)R ALLOCATED TO S
F0308X	(LL,MB,IB)	FRACTION OF L(L)- ALLOCATED TO B(M)
F0401X	(IF,IB)	FRACTION OF G3 ALLOCATED AGAINST G1
F0402X	(IF,IB)	FRACTION OF G4 ALLOCATED AGAINST G1
F0601X	(IF,IB)	FRACTION OF MAX. FEBA RATE COMMANDED FOR F(I)
P0001X	(JA,KA,IB)	PROBABILITY OF DETECTION - AA(J) AGAINST AA(K)
P0002X	(JA,KA,IB)	PROBABILITY OF KILL - AA(J) AGAINST AA(K)
P0003X	(JA,KA,IB)	PROBABILITY OF DETECTION - AA(J) AGAINST AG(K)
P0004X	(JA,KA,IB)	PROBABILITY OF KILL - AA(J) AGAINST AG(K)
P0101X	(JA,NK,IB)	KILL FACTOR - AG(J) AGAINST G1F
P0102X	(JA,NK,IB)	KILL FACTOR - AG(J) AGAINST G2F
P0103X	(JA,IB)	SSPK - AREA AIR DEFENSE AGAINST AG(J)
P0104X	(JA,IB)	TERMINAL DEFENSE PK - G1 AGAINST AG(J)
P0105X	(JA,IB)	TERMINAL DEFENSE PK - G2 AGAINST AG(J)
P0107X	(JA,IB)	TERMINAL DEFENSE PK - S AGAINST AG(J)
P0108X	(LL,JA,IB)	TERMINAL DEFENSE PK - L(L) AGAINST AG(J)
P0109X	(MB,JA,IB)	TERMINAL DEFENSE PK - B(M) AGAINST AG(J)
P0301X	(LL,IB)	KILL FACTOR - M(L) AGAINST G1F
P0302X	(LL,IB)	KILL FACTOR - M(L) AGAINST G2F
P0303X	(LL,IB)	KILL FACTOR - M(L) AGAINST G1R
P0304X	(LL,IB)	KILL FACTOR - M(L) AGAINST G2R
P0305X	(LL,KL,IB)	KILL FACTOR - M(L) AGAINST L(K)
P0306X	(LL,IB)	KILL FACTOR - M(L) AGAINST S
P0307X	(LL,MB,IB)	KILL FACTOR - M(L) AGAINST A/C ON B(M)
P0323X	(JA,NK,IB)	KILL FACTOR - AG(J) AGAINST G1R
P0324X	(JA,NK,IB)	KILL FACTOR - AG(J) AGAINST +2-
P0325X	(JA,NK,IB)	KILL FACTOR - AG(J) AGAINST S
P0326X	(JA,LL,NB)	KILL FACTOR - AG(J) AGAINST L(L)
P0327X	(JA,MB,NB)	KILL FACTOR - AG(J) AGAINST A/C ON B(M)
P0401X	(IB)	KILL FACTOR - G1 AGAINST G1
P0402X	(IB)	KILL FACTOR - G3 AGAINST G1
P0403X	(IB)	KILL FACTOR - G4 AGAINST G1
P0404X	(IB)	KILL FACTOR - G3 AGA+NST G2
P0405X	(IB)	KILL FACTOR - G4 AGAINST G2
R0001X	(MB,JA,IB)	MAXIMUM DESIRED LAUNCH RATE OF A(J) ON B(M)
R0301X	(LL,IB)	MAX. DESIRED MISSILE LAUNCH RATE FOR L(L)
R0401X	(IB)	MAX. DESIRED LAUNCH OR FIRE RATE OF G3
R0402X	(IB)	MAX. DESIRED LAUNCH OR FIRE RATE OF G4
R0571X	(MB,JA,IB)	EXTERNAL RATE OF SUPPLY OF A(J) TO B(M)
R0572X	(MB,NK,IB)	EXTERNAL RATE OF SUPPLY OF A(N) TO B(M)
R0574X	(IB)	EXTERNAL RATE OF SUPPLY OF G1
R0575X	(IB)	EXTERNAL RATE OF SUPPLY OF G2
R0576X	(IB)	EXTERNAL RATE OF SUPPLY OF G5
R0577X	(IB)	EXTERNAL RATE OF SUPPLY OF G6
R0578X	(LM,IB)	EXTERNAL RATE OF SUPPLY OF M(L)
R0579X	(LL,IB)	EXTERNAL RATE OF SUPPLY OF L(L)

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R0601X                  MAXIMUM FEBA MOVEMENT RATE
R0602X  (IB)            MAXIMUM RATE OF FLOW OF G1 FROM R TO F
R0603X  (IB)            MAXIMUM RATE OF FLOW OF G2 FROM R TO F
R0604X  (IB)            MAXIMUM RATE OF FLOW OF G5 FROM R TO F
R0605X  (IB)            MAXIMUM RATE OF FLOW OF G6 FROM R TO F
R0700X  (MB,IB)         REPAIR RATE PER B(M)

V0541X  (LL,IB)         NOMINAL NUMBER OF M(L) AT EACH L(L)
V0545X  (LL,IB)         AMOUNT OF M(L) IN TRANSIT IN R
V0551X  (IB)            AMOUNT OF G5 IN TRANSIT IN R
V0552X  (IB)            AMOUNT OF G6 IN TRANSIT IN R
V0601X  (IF,IB)         MAXIMUM USABLE G1 IN F(I)
V0      (JC,IB)         INITIAL CONDITIONS FOR COMMODITIES
V       (JC,IB)         COMODDITIES V AND DV
AV      (NA,IB)         ACQUIRED TOTALS AV AND DAV
A0001P  (JA,IB)         ATTRITION AA ON A(J)A
A0002P  (JA,IB)         ATTRITION AA ON A(J)G
A0101P  (IF,JA,IB)      ATTRITION G1F(I) ON A(J)G
A0102P  (IF,JA,IB)      ATTRITION G2F(I) ON A(J)G
A0103P  (JA,IB)         ATTRITION G1R ON A(J)G
A0104P  (JA,IB)         ATTRITION G2R ON A(J)G
A0105P  (JA,IB)         ATTRITION S ON A(J)G
A0106P  (LL,JA,IB)      ATTRITION L(L) ON A(J)G
A0107P  (MB,JA,IB)      ATTRITION B(M) ON A(J)G
A0301P  (LL,IF,IB)      ATTRITION M(L) ON G1F(I)
A0302P  (LL,IF,IB)      ATTRITION M(L) ON G2F(I)
A0303P  (LL,IB)         ATTRITION M(L) ON G1R
A0304P  (LL,IB)         ATTRITION M(L) ON G2R
A0305P  (LL,KL,IB)      ATTRITION M(L) ON L(K)
A0306P  (LL,IB)         ATTRITION M(L) ON S
A0307P  (LL,JA,IB)      ATTRITION M(L) ON A(J)B1
A0308P  (LL,JA,IB)      ATTRITION M(L) ON A(J)B2
A0321P  (JA,IF,IB)      ATTRITION A(J)G ON G1F(I)
A0322P  (JA,IF,IB)      ATTRITION A(J)G ON G2F(I)
A0323P  (JA,IB)         ATTRITION A(J)G ON G1R
A0324P  (JA,IB)         ATTRITION A(J)G ON G2R
A0325P  (JA,IB)         ATTRITION A(J)G ON S
A0326P  (JA,LL,IB)      ATTRITION A(J)G ON L(L)
A0327P  (JA,KA,IB)      ATTRITION A(J)G ON A(I)B1
A0328P  (JA,KA,IB)      ATTRITION A(J)G ON A(I)B2
A0401P  (IF,IB)         ATTRITION G1F(I) ON G1F(I)
A0402P  (IF,IB)         ATTRITION G3F(I) ON G1F(I)
A0403P  (IF,IB)         ATTRITION G4F(I) ON G1F(I)
A0404P  (IF,IB)         ATTRITION G3F(I) ON G2F(I)
A0405P  (IF,IB)         ATTRITION G4F(I) ON G2F(I)
A0501P  (IF,IB)         TOTAL DIRECT ATTRITION G1F(I)
A0511P  (JA,IB)         ATTRITION AA ON A(J)
A0512P  (JA,IB)         TOTAL DIRECT ATTRITION ON A(J)GS
A0513P  (MB,JA,IB)      TOTAL DIRECT ATTRITION OF A(J)B(M) ON THE GROUND
A0514P  (JA,IB)         TOTAL DIRECT ATTRITION ON A(J)
A0515P  (MB,IB)         ASSOCIATED ATTRITION OF AB(M) ON A4B(M)
A0516P  (MB,IB)         ASSOCIATED ATTRITION OF AB(M) ON A5B(M)
A0517P  (MB,JA,IB)      TOTAL DIRECT ATTRITION OF A(J),B(M)
A0521P  (IF,IB)         TOTAL DIRECT ATTRITION ON G2F(I)
A0522P  (IF,IB)         ASSOCIATED ATTRITION G1F(I) ON G2F(I)
A0531P  (IB)            TOTAL DIRECT ATTRITION ON G1R
A0532P  (IB)            TOTAL DIRECT ATTRITION ON G2R
A0533P  (IB)            ASSOCIATED ATTRITION G1R ON G2R
A0540P  (IB)            TOTAL S ATTRITION
A0541P  (LL,IB)         TOTAL DIRECT ATTRITION ON L(L)
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A0542P (LL,IB)	ASSOCIATED ATTRITION L(L) ON M(L)
A0543P (LL,IB)	ASSOCIATED ATTRITION SITE ON M(L)
A0544P (LM,IB)	G2R ASSOCIATED ATTRITION OF M(L)
A0551P (IF,IB)	ASSOCIATED ATTRITION G2F(I) ON G5F(I)
A0552P (IF,IB)	ASSOCIATED ATTRITION G2F(I) ON G6F(I)
A0561P (IB)	ASSOCIATED ATTRITION G2R ON G5R
A0562P (IB)	ASSOCIATED ATTRITION G2R ON G6R
A0563P (IB)	S ASSOCIATED ATTRITION OF G5R
A0564P (IB)	S ASSOCIATED ATTRITION OF G6R
E0511P (MB,IB)	EXPENDITURE OF A4B(M)
E0512P (MB,IB)	EXPENDITURE OF A5B(M)
E0521P (IF,IB)	EXPENDITURE RATE OF G2F(I)
E0551P (IF,IB)	EXPENDITURE RATE OF G5F(I)
E0552P (IF,IB)	EXPENDITURE RATE OF G6F(I)
R0001P (JA,MB,IB)	TOTAL A(J)B(M) LAUNCH RATE
R0002P (JA,IB)	RATE EA(J)A
R0003P (JA,IB)	RATE EA(J)G
R0004P (JA,IB)	RATE EA(J)GS
R0005P (IB)	TOTAL AB(M) LAUNCH RATE
R0006P (JA,MB,IB)	LAUNCH RATE OF A(J)B(M) WITH A4
R0007P (JA,MB,IB)	LAUNCH RATE OF A(J)B(M) WITH A5
R0301P (LM,IF,IB)	FLOW M(L) AGAINST G1 IN F(I)
R0302P (LM,IF,IB)	FLOW M(L) AGAINST G2 IN F(I)
R0303P (LM,IB)	FLOW M(L) AGAINST G1R
R0304P (LM,IB)	FLOW M(L) AGAINST G2R
R0305P (LM,KL,IB)	FLOW M(L) AGAINST L(K)
R0306P (LM,IB)	FLOW M(L) AGAINST M(K)
R0307P (LM,MB,IB)	FLOW M(L) AGAINST B(M)
R0321P (JA,IF,IB)	FLOW OF AG(J) AGAINST G1F(I)
R0322P (JA,IF,IB)	FLOW OF AG(J) AGAINST G2F(I)
R0323P (JA,IB)	FLOW OF AG(J) AGAINST G1R
R0324P (JA,IB)	FLOW OF AG(J) AGAINST G2R
R0325P (JA,IB)	FLOW OF AG(J) AGAINST S
R0326P (JA,LL,IB)	FLOW OF AG(J) AGAINST L(L)
R0327P (JA,MB,IB)	FLOW OF AG(J) AGAINST B(M)
R0401P (IF,IB)	FLOW OF G5F(I) FROM F(I) TO G1F(I)
R0402P (IF,IB)	FLOW OF G6F(I) FROM F(I) TO G1F(I)
R0403P (IF,IB)	FLOW OF G5F(I) FROM F(I) TO G2F(I)
R0404P (IF,IB)	FLOW OF G6F(I) FROM F(I) TO G2F(I)
R0541P (LL,IB)	TOTAL FLOW M(L) FROM R
R0571P (MB,JA,IB)	EXTERNAL RATE OF SUPPLY OF A(J)B(M)
R0572P (MB,NK,IB)	EXTERNAL RATE OF SUPPLY OF A(N)B(M)
R0574P (IB)	EXTERNAL RATE OF SUPPLY OF G1
R0575P (IB)	EXTERNAL RATE OF SUPPLY OF G2
R0576P (IB)	EXTERNAL RATE OF SUPPLY OF G5
R0577P (IB)	EXTERNAL RATE OF SUPPLY OF G6
R0578P (LM,IB)	EXTERNAL RATE OF SUPPLY OF M(L)
R0579P (LL,IB)	EXTERNAL RATE OF SUPPLY OF L(L)
R0601P (IF,IB)	FLOW OF G1R TO F(I)
R0602P (IF,IB)	FLOW OF G2R TO F(I)
R0603P (IF,IB)	FLOW OF G5R TO F(I)
R0604P (IF,IB)	FLOW OF G6R TO F(I)
C0001P (JA,KA,IB)	A(J)A SURVIVAL PROBABILITY AGAINST A(K)A
C0002P (JA,KA,IB)	A(J)G SURVIVAL PROBABILITY AGAINST A(K)A
C0003P (LM,IB)	DEGRADATION FACTOR AT B(M)
C0601P (IF,IB)	R FACTOR FOR F(I) FEBA MOVEMENT

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D0601P (IF,IB)        DEMAND FOR G1R FROM F(I)
D0602P (IF,IB)        DEMAND FOR G2R FROM F(I)
D0603P (IF,IB)        DEMAND FOR G5R FROM F(I)
D0604P (IF,IB)        DEMAND FOR G6R FROM F(I)

F0101P (JA,IF,IB)     FRACTION OF AF(J) TO F(I)
F0103P (JA,IF,IB)     FRACTION OF A(J)GS TO G1F(I)
F0105P (JA,IF,IB)     FRACTION OF A(J)GS TO G2F(I)
F0106P (JA,IB)        FRACTION OF A(J)GS TO G1R
F0107P (JA,IB)        FRACTION OF A(J)GS TO G2R
F0108P (JA,IB)        FRACTION OF A(J)GS TO S
F0109P (JA,LL,IB)     FRACTION OF A(J)GS TO L(L)
F0110P (JA,MB,IB)     FRACTION OF A(J)GS TO B(M)
F0301P (LL,IF,IB)     FRACTION L(L)F(I) TO G1
F0302P (LL,IF,IB)     FRACTION L(L)F(I) TO G2
F0303P (LL,IB)        FRACTION L(L)R TO G1
F0304P (LL,IB)        FRACTION L(L)R TO G2
F0305P (LL,KL,IB)     FRACTION L(L)R TO L(K)
F0306P (LL,IB)        FRACTION L(L) TO S
F0307P (LL,MB,IB)     FRACTION L(L)R TO B(M)
F0321P (MB,JA,IB)     FRACTION OF A(J)A FROM A(J)B(M)
F0322P (MB,JA,IB)     FRACTION OF A(J)G FROM A(J)B(M)
F0323P (JA,NK,IB)     FRACTION OF A(J)G CARRYING A(N)

P0101P (JA,IF,IB)     ACQUISITION FACTOR A(J)G ON G1F(I)
P0102P (JA,IF,IB)     ACQUISITION FACTOR A(J)G ON G2F(I)
P0103P (IF,JA,IB)     KILL FACTOR - G1F(I) AGAINST A(J)G
P0104P (IF,JA,IB)     KILL FACTOR - G2F(I) AGAINST A(J)G
P0105P (JA,IB)        KILL FACTOR - REAR AREA AGAINST A(J)G
P0106P (JA,IB)        ACQUISITION FACTOR A(J)G ON G1R
P0108P (JA,IB)        ACQUISITION FACTOR A(J)G ON G2R
P0110P (JA,LL,IB)     ACQUISITION FACTOR FOR A(J)G ON L(L)
P0301P (LL,IF,IB)     ACQUISITION FACTOR L(L) ON G1F(I)
P0302P (LL,IF,IB)     ACQUISITION FACTOR L(L) ON G2F(I)
P0303P (LL,IB)        ACQUISITION FACTOR L(L) ON G1R
P0304P (LL,IB)        ACQUISITION FACTOR L(L) ON G2R
P0305P (LL,KL,IB)     ACQUISITION FACTOR L(L) ON L(K)
P0402P (IF,IB)        ACQUISITION FACTOR G3F(I) ON G1F(I)
P0403P (IF,IB)        ACQUISITION FACTOR G3F(I) ON G2F(I)
P0404P (IF,IB)        ACQUISITION FACTOR G4F(I) ON G1F(I)
P0405P (IF,IB)        ACQUISITION FACTOR G4F(I) ON G2F(I)

V0301P (MB,IB)        TOTAL NUMBER OF A/C ON B(M)
V0401P (IF,IB)        G3F(I)
V0402P (IF,IB)        G4F(I)
V0541P (LM,IB)        NUMBER OF M(L) PER L(L)
V0542P (LM,IB)        NUMBER OF M(L) IN SITES
V0545P (LM,IB)        NUMBER OF M(L) IN TRANSIT
V0601P (IF,IB)        DESIRED AMOUNT OF G2 AT F(I)
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AIR TABLES DECK

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TITLE1        GROUND FORCE PACKETS (G1)
V0       1    GROUND FORCES IN FRONT 1
V0       2                  IN FRONT 2
V0       3                  IN FRONT 3
V0       4                  IN THE REAR
R0574X        RATE OF EXTERNAL SUPPLY OF GROUND FORCES
R0602X        MAXIMUM FLOW RATE OF G1 BETWEEN R AND F PER G1R
P0401X        PROBABILITY OF KILL FOR GROUND FORCES VS. OPPOSING GROUND FORCES
E0521X        GROUND FORCE EXPENDITURE RATE OF SUPPLY PACKETS
V0601X 1      MAXIMUM ALLOWABLE GROUND FORCE PACKETS IN FRONT 1
V0601X 2                                             IN FRONT 2
V0601X 3                                             IN FRONT 3
TITLE2        FEBA MOVEMENT (F AND R)
V0      36    CO-ORDINATES OF FRONT 1
V0      37                 OF FRONT 2
V0      38                 OF FRONT 3
R0601X-5      MAXIMUM FEBA ADVANCE RATE
F0601X 1      FRACTION OF THE MAX FEBA RATE USED FOR FRONT 1
F0601X 2      FRACTION OF FRONT 1-S FEBA RATE USED FOR FRONT 2
F0601X 3                                           FOR FRONT 3
C0601X-5      SHAPING FACTOR FOR FEBA MOVEMENT
TITLE2        SUPPLY PACKETS (G2)
V0       7    SUPPLIES IN FRONT 1
V0       8             IN FRONT 2
V0       9             IN FRONT 3
V0      10             IN THE REAR
R0575X        RATE OF EXTERNAL SUPPLY OF SUPPLY PACKETS
C0522X        MAXIMUM DESIRABLE SUPPLY PACKETS PER FRONTAL GROUND FORCE UNIT
R0603X        MAXIMUM FLOW RATE OF SUPPLIES BETWEEN R AND F PER REAR SUPPLY PACKET
C0606X        NUMBER OF SUPPLY PACKETS ASSOCIATED WITH EACH GROUND FORCE PACKET
C0521X        LOSS RATE OF ASSOCIATED SUPPLIES PER LOSS OF GROUND FORCE PACKET
TITLE1        AIR BASE (B1 AND B2)
V0      14    NUMBER OF FORWARD AIR BASES (B1)
V0      16    STATE OF REPAIR FOR THE FORWARD BASES
R0700X 1      REPAIR RATE FOR THE FORWARD BASES
V0      15    NUMBER OF LONG RANGE AIR BASES (B2)
V0      17    STATE OF REPAIR FOR THE LONG RANGE BASES
R0700X 2      REPAIR RATE FOR THE L-R BASES
SPACE
V0      24    NUMBER OF CONVENTIONAL LOADS FOR AIRCRAFT (A4) AT FORWARD BASES
V0      25                                                   AT LONG RANGE BASES
R0572X 1 2    RATE OF EXTERNAL SUPPLY OF A4 TO FORWARD BASES
R0572X 2 2                                  TO LONG RANGE BASES
V0      26    NUMBER OF NUCLEAR LOADS FOR AIRCRAFT (A5) AT FORWARD BASES
V0      27                                              AT LONG RANGE BASES
R0572X 1 1    RATE OF EXTERNAL SUPPLY OF A5 TO FORWARD BASES
R0572X 2 1                                  TO LONG RANGE BASES
C0511X        CONVENTIONAL MUNITIONS LOST PER INTERCEPTER LOST ON THE GROUND
C0512X 1      NUC WEAPONS LOST PER F-B IN A NUCLEAR ROLE LOST ON THE GROUND
C0512X 2      CONV WEAPONS LOST PER F-B IN A CONVENTIONAL ROLE LOST ON THE GROUND
C0513X 1      NUC WEAPONS LOST PER LRA IN A NUCLEAR ROLE LOST ON THE GROUND
C0513X 2      CONV WEAPONS LOST PER LRA IN A CONVENTIONAL ROLE LOST ON THE GROUND
TITLE2        MUNITION STORAGE SITES (S)
V0      13    NUMBER OF SITES
TITLE1        CENTRAL COMMAND ACQUISTION SYSTEM
C0010X        FRONTAL GROUND FORCES&INITIAL PERCENT OF KNOWLEDGE
C0251X                              FRACTIONAL RATE OF ACQUISITION
C0261X                              FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0020X        FRONTAL SUPPLY PACKETS&INITIAL PERCENT OF KNOWLEDGE
C0252X                               FRACTIONAL RATE OF AQUISITION
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C0262X                             FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0030X       REAR GROUND FORCES&INITIAL PERCENT OF KNOWLEDGE
C0253X                           FRACTIONAL RATE OF ACQUISITION
C0263X                           FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0040X       REAR SUPPLY PACKETS&INITIAL PERCENT OF KNOWLEDGE
C0254X                            FRACTIONAL RATE OF ACQUISITION
C0264X                            FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0050X 1     LONG RANGE WEAPON SYSTEM 1&INITIAL PERCENT OF KNOWLEDGE
C0255X 1                                 FRACTIONAL RATE OF ACQUISITION
C0265X 1                                 FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0050X 2     LONG RANGE WEAPON SYSTEM 2&INITIAL PERCENT OF KNOWLEDGE
C0255X 2                                 FRACTIONAL RATE OF ACQUISITION
C0265X 2                                 FRACTIONAL RATE OF LOSS OF KNOWLEDGE
TITLE2       LOGISTIC DEMAND AND SUPPLY
C0604X       DEMAND SCALE FACTOR
C0605X       DEMAND RESPONSE UNIT CONVERSION FACTOR
C0603X 1     RATIO-FRONT 1 GROND FORCE LOSSES TO FRONT DEMAND
C0603X 2          FRONT 2
C0603X 3          FRONT 3
C0607X       RATIO-LOSS/EXPENDITURE TO REPLACEMENT FOR FRONTAL SUPPLIES
C0611X       RATIO-REPLACEMENT TO LOSS FOR FRONTAL WEAPON SYSTEM 1 MUNITIONS
C0614X                                FOR FRONTAL WEAPON SYSTEM 2 MUNITIONS
TITLE1       AIR DEFENSES
P0103X 1     SINGLE SHOT PK FOR AREA AIR DEFENSE AGAINST A1G
P0103X 2                                                 A2G
P0103X 3                                                 A3G
F0102X       FRACTION OF AREA AIR DEFENSE SEEN BY THE FRONTAL FORCES ATTACKERS
F0103X                                     BY THE FRONTAL SUPPLY ATTACKERS
F0109X                                     BY REAR AREA ATTACKERS
P0104X 1     PK FOR TERMINAL AIR DEFENSE OF GROUND FORCES AGAINST A1G
P0104X 2                                                          A2G
P0104X 3                                                          A3G
P0105X 1                               OF SUPPLY PACKETS AGAINST A1G
P0105X 2                                                          A2G
P0105X 3                                                          A3G
P0107X 1                               OF STORAGE SITES AGAINST A1G
P0107X 2                                                         A2G
P0107X 3                                                         A3G
P0108X 1 1                             OF L-R WEAPON SYSTEM 1 AGAINST A1G
P0108X 1 2                                                            A2G
P0108X 1 3                                                            A3G
P0108X 2 1                             OF L-R WEAPON SYSTEM 2 AGAINST A1G
P0108X 2 2                                                            A2G
P0108X 2 3                                                            A3G
P0109X 1 1                             OF FORWARD BASES AGAINST A1G
P0109X 1 2                                                  A2G
P0109X 1 3                                                  A3G
P0109X 2 1                             OF LONG RANGE BASES AGAINST A1G
P0109X 2 2                                                     A2G
P0109X 2 3                                                     A3G
TITLE1       FRONTAL WEAPON SYSTEMS
TITLE2       WEAPON SYSTEM 1 (G3-G5)
C0406X       NUMBER OF WEAPONS (G3) PER GROUND FORCE PACKET
R0401X       MAXIMUM FIRE RATE PER WEAPON
F0401X 1     FRACTION OF WEAPONS ALLOCATED AGAINST GROUND FORCES IN FRONT 1
F0401X 2                                                         IN FRONT 2
F0401X 3                                                         IN FRONT 3
F0401X 1-1                               AGAINST SUPPLIES IN FRONT 1
F0401X 2-1                                                IN FRONT 2
F0401X 3-1                                                IN FRONT 3
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C0242X       FRACTION OF FRONTAL FORCES WITHIN WEAPON-S RANGE
C0243X       FRACTION OF FRONTAL SUPPLIES WITHIN WEAPON-S RANGE
P0402X       WEAPON-S PK AGAINST GROUND FORCES
P0404X                   AGAINST SUPPLIES
SPACE
V0     28    NUMBER OF WEAPON SYSTEM 1 ROUNDS (G5) IN FRONT 1
V0     29                                          IN FRONT 2
V0     30                                          IN FRONT 3
V0     31                                          IN THE REAR
V0551X       MAXIMUM ROUNDS IN TRANSIT IN THE REAR
R0576X       EXTERNAL RATE OF SUPPLY OF ROUNDS
R0604X       MAXIMUM FLOW RATE OF ROUNDS BETWEEN THE REAR AND THE FRONTS PER G5R
C0610X       NUMBER OF ROUNDS ASSOCIATED WITH EACH GROUND FORCE PACKET
C0551X       LOSS RATE OF ASSOCIATED ROUNDS PER SUPPLY PACKET LOSS
TITLE2       WEAPON SYSTEM 2 (G4-G6)
C0407X       NUMBER OF WEAPONS (G4) PER GROUND FORCE PACKET
R0402X       MAXIMUM FIRE RATE PER WEAPON
F0402X 1     FRACTION OF WEAPONS ALLOCATED AGAINST GROUND FORCES IN FRONT 1
F0402X 2                                                         IN FRONT 2
F0402X 3                                                         IN FRONT 3
F0402X 1-1                              AGAINST SUPPLIES IN FRONT 1
F0402X 2-1                                               IN FRONT 2
F0402X 3-1                                               IN FRONT 3
C0244X       FRACTION OF FRONTAL FORCES WITH IN WEAPON-S RANGE
C0245X       FRACTION OF FRONTAL SUPPLIES WITHIN WEAPON-S RANGE
P0403X       WEAPON-S PK AGAINST GROUND FORCES
P0405X                   AGAINST SUPPLIES
SPACE
V0     32    NUMBER OF WEAPON SYSTEM 2 ROUNDS (G6) IN FRONT 1
V0     33                                          IN FRONT 2
V0     34                                          IN FRONT 3
V0     35                                          IN THE REAR
V0552X       MAXIMUM ROUNDS IN TRANSIT IN THE REAR
R0577X       EXTERNAL RATE OF SUPPLY OF ROUNDS
R0605X       MAXIMUM FLOW RATE OF ROUNDS BETWEEN THE REAR AND THE FRONTS PER G6R
C0613X       NUMBER OF ROUNDS ASSOCIATED WITH EACH GROUND FORCE PACKET
C0552X       LOSS RATE OF ASSOCIATED ROUNDS PER SUPPLY PACKET LOSS
TITLE1       LONG RANGE WEAPON SYSTEM
TITLE2       SYSTEM 1 (L1 AND M1)
V0      5    NUMBER OF WEAPONS (L1)
R0579X 1     RATE OF EXTERNAL SUPPLY OF WEAPONS
R0301X 1     MAXIMUM FIRE PER WEAPON
F0301X 1     FRACTION OF WEAPONS ALLOCATED AGAINST FRONTAL TARGETS
F0302X 1 1   FRACTION OF FRONT WEAPONS   ALLOCATED AGAINST FRONT 1
F0302X 1 2                                         AGAINST FRONT 2
F0302X 1 3                                         AGAINST FRONT 3
F0303X 1 1   FRACTION OF FRONT 1 WEAPONS ALLOCATED AGAINST GROUND FORCES
F0303X 1 2            OF FRONT 2
F0303X 1 3            OF FRONT 3
F0303X 1 1-1FRACTION OF FRONT 1 WEAPONS ALLOCATED AGAINST SUPPLY PACKETS
F0303X 1 2-1          OF FRONT 2
F0303X 1 3-1          OF FRONT 3
C0231X 1     FRACTION OF FRONTAL FORCES WIHIN WEAPON-S RANGE
C0232X 1     FRACTION OF FRONTAL SUPPLIES WITHIN WEAPON-S RANGE
P0301X 1     WEAPON-S PK ON FRONTAL FORCES
P0302X 1                 ON FRONTAL SUPPLIES
F0301X 1-1   FRACTION OF WEAPONS ALLOCATED AGAINST REAR TARGETS
F0304X 1     FRACTION OF REAR WEAPONS   ALLOCATED AGAINST GROUND FORCES
F0305X 1                                          AGAINST SUPPLIES
F0306X 1 1                                        AGAINST L-R WEAPON SYSTEM 1
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F0306X 1 2                                             AGAINST L-R WEAPON SYSTEM 2
F0307X 1                                               AGAINST STORAGE SITES
F0308X 1 1                                             AGAINST FORWARD BASES
F0308X 1 2                                             AGAINST LONG RANGE BASES
C0233X 1     FRACTION OF REAR FORCES WITHIN WEAPON-S   RANGE
C0234X 1                 REAR SUPPLIES
C0235X 1 1               L-R WEAPON SYSTEM 1
C0235X 1 2               L-R WEAPON SYSTEM 2
P0303X 1     WEAPON-S PK ON REAR GROUND FORCES
P0304X 1                    REAR SUPPLIES
P0305X 1 1                  L-R WEAPON SYSTEM 1
P0305X 1 2                  L-R WEAPON SYSTEM 2
P0306X 1                    STORAGE SITES
P0307X 1 1                  FORWARD BASES
P0307X 1 2                  LONG RANGE BASES
SPACE
V0     11    NUMBER OF ROUNDS (M1)
R0578X 1     RATE OF EXTERNAL SUPPLY OF ROUNDS
V0541X 1     NUMBER OF ROUNDS ASSOCIATED WITH EACH WEAPON
V0545X 1     MAXIMUM NUMBER IN TRANSIT IN THE REAR
TITLE1       LONG RANGE WEAPON SYSTEM
TITLE2       SYSTEM 2 (L2 AND M2)
V0     6     NUMBER OF WEAPONS (L2)
R0579X 2     RATE OF EXTERNAL SUPPLY OF WEAPONS
R0301X 2     MAXIMUM FIRE PER WEAPON
F0301X 2     FRACTION OF WEAPONS ALLOCATED AGAINST FRONTAL TARGETS
F0302X 2 1   FRACTION OF FRONT WEAPONS   ALLOCATED AGAINST FRONT 1
F0302X 2 2                                              AGAINST FRONT 2
F0302X 2 3                                              AGAINST FRONT 3
F0303X 2 1   FRACTION OF FRONT 1 WEAPONS ALLOCATED AGAINST GROUND FORCES
F0303X 2 2                          FRONT 2
F0303X 2 3                          FRONT 3
F0303X 2 1-1FRACTION OF FRONT 1 WEAPONS ALLOCATED AGAINST SUPPLY PACKETS
F0303X 2 2-1                        FRONT 2
F0303X 2 3-1                        FRONT 3
C0231X 2     FRACTION OF FRONTAL FORCES WITHIN WEAPON-S RANGE
C0232X 2     FRACTION OF FRONTAL SUPPLIES WITHIN WEAPON-S RANGE
P0301X 2     WEAPON-S PK ON FRONTAL FORCES
P0302X 2                 ON FRONTAL SUPPLIES
F0301X 2-1   FRACTION OF WEAPONS ALLOCATED AGAINST REAR TARGETS
F0304X 2     FRACTION OF REAR WEAPONS   ALLOCATED AGAINST GROUND FORCES
F0305X 2                                               AGAINST SUPPLIES
F0306X 2 1                                             AGAINST L-R WEAPON SYSTEM 1
F0306X 2 2                                             AGAINST L-R WEAPON SYSTEM 2
F0307X 2                                               AGAINST STORAGE SITES
F0308X 2 1                                             AGAINST FORWARD BASES
F0308X 2 2                                             AGAINST LONG RANGE BASES
C0233X 2     FRACTION OF REAR FORCES WITHIN WEAPON-S   RANGE
C0234X 2                 REAR SUPPLIES
C0235X 2 1               L-R WEAPON SYSTEM 1
C0235X 2 2               L-R WEAPON SYSTEM 2
P0303X 2     WEAPON-S PK ON REAR GROUND FORCES
P0304X 2                 ON REAR SUPPLIES
P0305X 2 1                  L-R WEAPON SYSTEM 1
P0305X 2 2                  L-R WEAPON SYSTEM 2
P0306X 2                 STORAGE SITES
P0307X 2 1               FORWARD BASES
P0307X 2 2               LONG RANGE BASES
SPACE
V0     12    NUMBER OF ROUNDS (M2)
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R0578X 2     RATE OF EXTERNAL SUPPLY OF ROUNDS
V0541X 2     NUMBER OF ROUNDS ASSOCIATED WITH EACH WEAPON
V0545X 2     MAXIMUM NUMBER IN TRANSIT IN THE REAR
TITLE1       AIRCRAFT
TITLE2       INTERCEPTERS (A1)
V0    18     NUMBER OF INTERCEPTORS (A1) ON FORWARD BASES
V0    19                                 ON LONG RANGE BASES
R0571X 1 1   RATE OF EXTERNAL SUPPLY OF A1 TO FORWARD BASES
R0571X 2 1                                 TO LONG RANGE BASES
R0001X 1 1   MAXIMUM DESIRED LAUNCH RATE OF A1 AT FORWARD BASES
R0001X 2 1                                     AT LONG RANGE BASES
F0001X 1-1   FRACTION ASSIGNED TO AN AIR-TO-AIR (A2A) MISSION
E0511X       AMOUNT OF CONVENTIONAL MUNITIONS USED PER AA MISSION
P0001X 1 1   PROBABILITY OF DETECTING IN THE AIR BATTLE EACH ENEMY A1A
P0001X 1 2                                                         A2A
P0001X 1 3                                                         A3A
P0003X 1 1                                                         A1G
P0003X 1 2                                                         A2G
P0003X 1 3                                                         A3G
P0002X 1 1   PROBABILITY OF KILLING IN THE AIR BATTLE EACH ENEMY A1A
P0002X 1 2                                                       A2A
P0002X 1 3                                                       A3A
P0004X 1 1                                                       A1G
P0004X 1 2                                                       A2G
P0004X 1 3                                                       A3G
SPACE
F0001X 1     FRACTION ASSIGNED TO AN AIR-TO-GROUND (A1G) MISSION
E0512X 1 2   CONV MUNITIONS EXPENDED PER A1G MISSION
F0101X 1     FRACTION OF AIR-TO-GROUND SENT TO THE FRONTS
F0201X 1 1   FRACTION OF AIR-TO-GROUND IN FRONT 1 SENT TO GROUND FORCES
F0201X 1 2                             IN FRONT 2
F0201X 1 3                             IN FRONT 3
F0202X 1 1   FRACTION OF AIR-TO-GROUND IN FRONT 1 SENT TO SUPPLIES
F0202X 1 2                             IN FRONT 2
F0202X 1 3                             IN FRONT 3
C0211X 1     FRACTION OF FRONTAL FORCES WITHIN OPERATIONAL RANGE
C0212X 1     FRACTION OF FRONTAL SUPPLIES WITHIN OPERATIONAL RANGE
P0101X 1 2   PROBABILITY OF KILLING FRONTAL GROUND FORCES
P0102X 1 2                          FRONTAL SUPPLY PACKETS
F0101X 1-1   FRACTION OF AIR-TO-GROUND SENT TO THE REAR
F0104X 1     FRACTION OF AIR-TO-GROUND IN THE REAR SENT AGAINST GROUND FORCES
F0105X 1                                                AGAINST SUPPLIES
F0106X 1                                                AGAINST STORAGE SITES
F0107X 1 1                                              AGAINST L-R WEAPON SYS 1
F0107X 1 2                                              AGAINST L-R WEAPON SYS 2
F0108X 1 1                                              AGAINST FORWARD BASES
F0108X 1 2                                              AGAINST LONG RANGE BASES
C0213X 1     FRACTION OF REAR GROUND FORCES IN OPERATIONAL RANGE
C0214X 1              OF REAR SUPPLY PACKETS
C0215X 1 1            OF L-R WEAPON SYSTEM 1
C0215X 1 2            OF L-R WEAPON SYSTEM 2
P0323X 1 2   PROBABILITY OF KILLING REAR GROUND FORCES
P0324X 1 2                          REAR SUPPLIES
P0325X 1 2                          STORAGE SITES
P0326X 1 1 2                        L-R WEAPON SYSTEM 1
P0326X 1 2 2                        L-R WEAPON SYSTEM 2
P0327X 1 1 2                        AIRCRAFT ON FORWARD BASES
P0327X 1 2 2                        AIRCRAFT ON LONG RANGE BASES
C0307X 1 2   FACTOR FOR BASE DAMAGE ON FORWARD BASES
C0307X 2 2                          ON LONG RANGE BASES
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TITLE1      AIRCRAFT
TITLE2      FIGHTER BOMBERS  (A2)
V0     20   NUMBER OF F-B (A2) ON FORWARD BASES
V0     21                      ON LONG RANGE BASES
R0571X 1 2  RATE OF EXTERNAL SUPPLY OF A2 TO FORWARD BASES
R0571X 2 2                                TO LONG RANGE BASES
R0001X 1 2  MAXIMUM DESIRED LAUNCH RATE OF A2 AT FORWARD BASES
R0001X 2 2                                    AT LONG RANGE BASES
F0001X 2-1  FRACTION ASSIGNED TO AN AIR-TO-AIR (A2A) MISSION
E0511X      AMOUNT OF CONVENTIONAL MUNITIONS USED PER AA MISSION
P0001X 2 1  PROBABILITY OF DETECTING IN THE AIR BATTLE EACH ENEMY A1A
P0001X 2 2                                                        A2A
P0001X 2 3                                                        A3A
P0003X 2 1                                                        A1G
P0003X 2 2                                                        A2G
P0003X 2 3                                                        A3G
P0002X 2 1  PROBABILITY OF KILLING IN THE AIR BATTLE EACH ENEMY A1A
P0002X 2 2                                                      A2A
P0002X 2 3                                                      A3A
P0004X 2 1                                                      A1G
P0004X 2 2                                                      A2G
P0004X 2 3                                                      A3G
SPACE
F0001X 2    FRACTION ASSIGNED TO AN AIR-TO-GROUND (A2G) MISSION
E0512X 2 1  NUC MUNITIONS EXPENDED PER A2G MISSION
E0512X 2 2  CONV MUNITIONS
F0101X 2    FRACTION OF AIR-TO-GROUND SENT TO THE FRONTS
F0201X 2 1  FRACTION OF AIR-TO-GROUND IN FRONT 1 SENT TO GROUND FORCES
F0201X 2 2                            IN FRONT 2
F0201X 2 3                            IN FRONT 3
F0202X 2 1  FRACTION OF AIR-TO-GROUND IN FRONT 1 SENT TO SUPPLIES
F0202X 2 2                            IN FRONT 2
F0202X 2 3                            IN FRONT 3
C0211X 2    FRACTION OF FRONTAL FORCES IN OPERATIONAL RANGE
C0212X 2    FRACTION OF FRONTAL SUPPLIES IN OPERATIONAL RANGE
P0101X 2 1  PROBABILITY OF NUC KILL OF FRONTAL GROUND FORCES
P0101X 2 2              OF CONV KILL
P0102X 2 1              OF NUC KILL OF FRONTAL SUPPLIES
P0102X 2 2              OF CONV KILL
F0101X 2-1  FRACTION OF AIR-TO-GROUND SENT TO THE REAR
F0104X 2    FRACTION OF AIR-TO-GROUND IN THE REAR SENT AGAINST GROUND FORCES
F0105X 2                                               AGAINST SUPPLIES
F0106X 2                                               AGAINST STORAGE SITES
F0107X 2 1                                             AGAINST L-R WEAPON SYS 1
F0107X 2 2                                             AGAINST L-R WEAPON SYS 2
F0108X 2 1                                             AGAINST FORWARD BASES
F0108X 2 2                                             AGAINST LONG RANGE BASES
C0213X 2    FRACTION OF REAR GROUND FORCES IN OPERATIONAL RANGE
C0214X 2             OF REAR SUPPLIES
C0215X 2 1           OF L-R WEAPON SYSTEM 1
C0215X 2 2           OF L-R WEAPON SYSTEM 2
P0323X 2 1  PROBABILITY OF NUC KILL ON REAR GROUND FLORCES
P0323X 2 2              OF CONV KILL
P0324X 2 1              OF NUC KILL ON REAR SUPPLIES
P0324X 2 2              OF CONV KILL
P0325X 2 1              OF NUC KILL ON STORAGE SITES
P0325X 2 2              OF CONV KILL
P0326X 2 1 1            OF NUC KILL ON L-R WEAPON SYSTEM 1
P0326X 2 1 2            OF CONV KILL
P0326X 2 2 1            OF NUC KILL ON L-R WEAPON SYSTEM 2
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P0326X 2 2 2              OF CONV KILL
P0327X 2 1 1              OF NUC KILL ON AIRCRAFT ON FORWARD BASES
P0327X 2 1 2              OF CONV KILL
P0327X 2 2 1              OF NUC KILL ON AIRCRAFT ON LONG RANGE BASES
P0327X 2 2 2              OF CONV KILL
C0307X 1 1   FACTOR FOR NUC DAMAGE TO FORWARD BASES
C0307X 1 2          FOR CONV DAMAGE
C0307X 2 1          FOR NUC DAMAGE TO LONG RANGE BASES
C0307X 2 2          FOR CONV DAMAGE
TITLE1       AIRCRAFT
TITLE2       LONG RANGE AIRCRAFT (A3)
V0     22    NUMBER OF LRA (A3) ON FORWARD BASES
V0     23                       ON LONG RANGE BASES
R0571X 1 3   RATE OF EXTERNAL SUPPLY OF A3 TO FORWARD BASES
R0571X 2 3                                 TO LONG RANGE BASES
R0001X 1 3   MAXIMUM DESIRED LAUNCH RATE OF A3 AT FORWARD BASES
R0001X 2 3                                    AT LONG RANGE BASES
F0001X 3-1   FRACTION ASSIGNED TO AN AIR-TO-AIR (A3A) MISSION
E0511X       AMOUNT OF CONVENTIONAL MUNITIONS EXPENDED PER AA MISSION
P0001X 3 1   PROBABILITY OF DETECTING IN THE AIR BATTLE EACH ENEMY A1A
P0001X 3 2                                                         A2A
P0001X 3 3                                                         A3A
P0003X 3 1                                                         A1G
P0003X 3 2                                                         A2G
P0003X 3 3                                                         A3G
P0002X 3 1   PROBABILITY OF KILLING IN THE AIR BATTLE EACH ENEMY A1A
P0002X 3 2                                                       A2A
P0002X 3 3                                                       A3A
P0004X 3 1                                                       A1G
P0004X 3 2                                                       A2G
P0004X 3 3                                                       A3G
SPACE
F0001X 3     FRACTION ASSIGNED TO AN AIR-TO-GROUND (A3G) MISSION
E0512X 3 1   NUC MUNITIONS EXPENDED PER A3G MISSION
E0512X 3 2   CONV MUNITIONS
F0101X 3     FRACTION OF AIR-TO-GROUND SENT TO THE FRONTS
F0201X 3 1   FRACTION OF AIR-TO-GROUND IN FRONT 1 SENT TO GROUND FORCES
F0201X 3 2                             IN FRONT 2
F0201X 3 3                             IN FRONT 3
F0202X 3 1   FRACTION OF AIR-TO-GROUND IN FRONT 1 SENT TO SUPPLIES
F0202X 3 2                             IN FRONT 2
F0202X 3 3                             IN FRONT 3
C0211X 3     FRACTION OF FRONTAL FORCES IN OPERATIONAL RANGE
C0212X 3     FRACTION OF FRONTAL SUPPLIES IN OPERATIONAL RANGE
P0101X 3 1   PROBABILITY OF NUC KILL ON FRONTAL GROUND FORCES
P0101X 3 2               OF CONV KILL
P0102X 3 1               OF NUC KILL ON FRONTAL SUPPLIES
P0102X 3 2               OF CONV KILL
F0101X 3-1   FRACTION OF AIR-TO-GROUND SENT TO THE REAR
F0104X 3     FRACTION OF AIR-TO-GROUND IN THE REAR SENT AGAINST GROUND FORCES
F0105X 3                                                AGAINST SUPPLIES
F0106X 3                                                AGAINST STORAGE SITES
F0107X 3 1                                              AGAINST L-R WEAPON SYS 1
F0107X 3 2                                              AGAINST L-R WEAPON SYS 2
F0108X 3 1                                              AGAINST FORWARD BASES
F0108X 3 2                                              AGAINST LONG RANGE BASES
C0213X 3     FRACTION OF REAR GROUND FORCES IN OPERATIONAL RANGE
C0214X 3              OF REAR SUPPLIES
C0215X 3 1            OF L-R WEAPON SYSTEM 1
C0215X 3 2            OF L-R WEAPON SYSTEM 2
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AD-A052 025 BDM CORP MCLEAN VA F/G 15/7

COMBAT-II USER'S GUIDE.(U)

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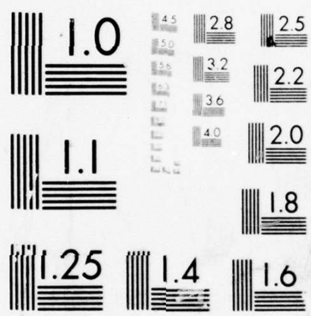

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

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P0323X 3 1   PROBABILITY OF NUC KILL ON REAR GROUND FORCES
P0323X 3 2               OF CONV KILL
P0324X 3 1               OF NUC KILL ON REAR SUPPLIES
P0324X 3 2               OF CONV KILL
P0325X 3 1               OF NUC KILL ON STORAGE SITES
P0325X 3 2               OF CONV KILL
P0326X 3 1 1             OF NUC KILL ON L-R WEAPON SYSTEM 1
P0326X 3 1 2             OF CONV KILL
P0326X 3 2 1             OF NUC KILL ON L-R WEAPON SYSTEM 2
P0326X 3 2 2             OF CONV KILL
P0327X 3 1 1             OF NUC KILL ON AIRCRAFT ON FORWARD BASES
P0327X 3 1 2             OF CONV KILL
P0327X 3 2 1             OF NUC KILL ON AIRCRAFT ON LONG RANGE BASES
P0327X 3 2 2             OF CONV KILL
C0307X 1 1   FACTOR FOR NUC DAMAGE TO FORWARD BASES
C0307X 1 2          FOR CONV DAMAGE
C0307X 2 1          FOR NUC DAMAGE TO LONG RANGE BASES
C0307X 2 2          FOR CONV DAMAGE
END
```

NOTES: The -5 indicates that the variable is unsubscripted.
The -1 indicates that the value is 1 minus the value of the variable with the same name and subscript.

C0010X	(IB)	PERCENT KNOWLEDGE INITIAL OF G1F
C0020X	(IB)	PERCENT KNOWLEDGE INITIAL OF G2F
C0030X	(IB)	PERCENT KNOWLEDGE INITIAL OF G1R
C0040X	(IB)	PERCENT KNOWLEDGE INITIAL OF G2R
C0050X	(LL,IB)	PERCENT KNOWLEDGE INITIAL OF L(L)
C0211X	(JA,IB)	RANGE FRACTION FOR A(J)G AGAINST G1F
C0212X	(JA,IB)	RANGE FRACTION FOR A(J)G AGAINST G2F
C0213X	(JA,IB)	RANGE FRACTION FOR A(J)G AGAINST G1R
C0214X	(JA,IB)	RANGE FRACTION FOR A(J)G AGAINST G2R
C0215X	(JA,LL,IB)	RANGE FRACTION FOR A(J)G AGAINST L(L)
C0231X	(LL,IB)	RANGE FRACTION FOR L(L) AGAINST G1F
C0232X	(LL,IB)	RANGE FRACTION FOR L(L) AGAINST G2F
C0233X	(LL,IB)	RANGE FRACTION FOR L(L) AGAINST G1R
C0234X	(LL,IB)	RANGE FRACTION FOR L(L) AGAINST G2R
C0235X	(LL,KL,IB)	RANGE FRACTION FOR L(L) AGAINST L(K)
C0242X	(IB)	RANGE FRACTION FOR G3F AGAINST G1F
C0243X	(IB)	RANGE FRACTION FOR G3F AGAINST G2F
C0244X	(IB)	RANGE FRACTION FOR G4F AGAINST G1F
C0245X	(IB)	RANGE FRACTION FOR G4F AGAINST G2F
C0251X	(IB)	FLOW OF G1F INTO NA
C0252X	(IB)	FLOW OF G2F INTO NA
C0253X	(IB)	FLOW OF G1R INTO NA
C0254X	(IB)	FLOW OF G2R INTO NA
C0255X	(LL,IB)	FLOW OF L(L) INTO NA
C0261X	(IB)	FLOW OF G1F OUT OF NA
C0262X	(IB)	FLOW OF G2F OUT OF NA
C0263X	(IB)	FLOW OF G1R OUT OF NA
C0264X	(IB)	FLOW OF G2R OUT OF NA
C0265X	(LL,IB)	FLOW OF L(L) OUT OF NA
C0307X	(MB,NK,IB)	COUPLING COEF - B(M) ATTACKS TO A/C LAUNCH DEG. FACTOR
C0406X	(IB)	UNITS OF G3 PER UNIT OF G1
C0407X	(IB)	UNITS OF G4 PER UNIT OF G1
C0511X	(IB)	COUPLING COEF. - A4 LOSSES TO AB(1) LOSSES
C0512X	(NK,IB)	COUPLING COEF. - A4/A5 LOSSES TO AB(2) LOSSES
C0513X	(NK,IB)	COUPLING COEF. - A4/A5 LOSSES TO AB(3) LOSSES
C0521X	(IB)	COUPLING COEF. - G2 LOSSES TO G1 LOSSES
C0522X	(IB)	MAXIMUM DESIRABLE G2 PER G1F
C0551X	(IB)	COUPLING COEF. - G5 LOSSES TO G2 LOSSES
C0552X	(IB)	COUPLING COEF. - G6 LOSSES TO G2 LOSSES
C0601X		SHAPING FACTOR FOR FEBA MOVEMENT
C0603X	(IF,IB)	COUPLING COEF. - G1F(I) ATTRITION LOSSES TO G1F(I) DEMAND
C0604X	(IB)	DEMAND SCALE FACTOR
C0605X	(IB)	DEMAND RESPONSE UNIT CONVERSION FACTOR
C0606X	(IB)	NUMBER OF G2 UNITS PER G1 UNIT
C0607X	(IB)	PORTION OF G2 EXPENDITURES AND LOSSES TO BE REPLACED
C0610X	(IB)	NUMBER OF G5 UNITS PER G1 UNIT
C0611X	(IB)	PORTION OF G5 EXPENDITURES AND LOSSES TO BE REPLACED
C0613X	(IB)	NUMBER OF G6 UNITS PER G1 UNIT
C0614X	(IB)	PORTION OF G6 EXPENDITURES AND LOSSES TO BE REPLACED
E0511X	(IB)	EXPENDITURE RATE OF A4 PER AA
E0512X	(JA,NK,IB)	EXPENDITURE RATE OF A(N) PER A(J)G
E0521X	(IB)	EXPENDITURE RATE OF G2 PER G1
F0001X	(JA,IB)	FRACTION OF A(J) ALLOCATED TO GROUND ATTACK M+SS+ON
F0101X	(JA,IB)	FRACTION OF AGS(J) ALLOCATED TO AF(J)
F0102X	(IB)	FRACTION OF AREA AIR DEFENSE SEEN BY GIF ATTACKE-
F0103X	(IB)	FRACTION OF AREA AI- DEFENSE SEEN BY G2F ATTACKE-
F0104X	(JA,IB)	FRACTION OF AR(J) ALLOCATED TO +1-
F0105X	(JA,IB)	FRACTION OF AR(J) ALLOCATED TO +2-

F0001X	(JA,IB)	FRACTION OF A(J) ALLOCATED TO GROUND ATTACK MISSION
F0101X	(JA,IB)	FRACTION OF AGS(J) ALLOCATED TO AF(J)
F0102X	(IB)	FRACTION OF AREA AIR DEFENSE SEEN BY G1F ATTACKER
F0103X	(IB)	FRACTION OF AREA AIR DEFENSE SEEN BY G2F ATTACKER
F0104X	(JA,IB)	FRACTION OF AR(J) ALLOCATED TO G1R
F0105X	(JA,IB)	FRACTION OF AR(J) ALLOCATED TO G2R
F0106X	(JA,IB)	FRACTION OF AR(J) ALLOCATED TO S
F0107X	(JA,LL,IB)	FRACTION OF AR(J) ALLOCATED TO L(L)
F0108X	(JA,MB,IB)	FRACTION OF AR(J) ALLOCATED TO B(M)
F0109X	(IB)	FRACTION OF AREA AIR DEFENSE SEEN BY REAR ATTACKER
F0110X	(KW,IB)	FRACTION OF AREA AIR DEFENSE SEEN BY W(K)F ATTACKER
F0111X	(JA,KW,IB)	FRACTION OF A(J)R ALLOCATED TO W(K)R
F0201X	(JA,IF,IB)	FRACTION OF A(J)F(I) ALLOCATED TO G1F(I)
F0202X	(JA,IF,IB)	FRACTION OF A(J)F(I) ALLOCATED TO G2F(I)
F0203X	(JA,IS,IB)	FRACTION OF A(J)F(I) ALLOCATED TO W(K)F(I)
F0301X	(LL,IB)	FRACTION OF L(L) ALLOCATED TO FRONT
F0302X	(LL,IF,IB)	FRACTION OF L(L)F ALLOCATED TO F(I)
F0303X	(LL,IF,IB)	FRACTION OF L(L)F(I) ALLOCATED TO G1F(I)
F0304X	(LL,IB)	FRACTION OF L(L)R ALLOCATED TO G1R
F0305X	(LL,IB)	FRACTION OF L(L)R ALLOCATED TO G2R
F0306X	(LL,KL,IB)	FRACTION OF L(L)R ALLOCATED TO L(K)
F0307X	(LL,IB)	FRACTION OF L(L)R ALLOCATED TO S
F0308X	(LL,MB,IB)	FRACTION OF L(L)R ALLOCATED TO B(M)
F0309X	(JA,MB,IB)	FRACTION OF A(J) OCCUPYING B(M)
F0310X	(LL,IS,IB)	FRACTION OF L(L)F(I) ALLOCATED TO W(K)F(I)
F0311X	(LL,KW,IB)	FRACTION OF L(L)R ALLOCATED TO W(K)R
F0312X	(LL,IF,IB)	FRACTION OF L(L)F(I) ALLOCATED TO G2F(I)
F0402X	(KW,IB)	FRACTION OF W(K)F ALLOCATED TO G1F
F0403X	(KW,IB)	FRACTION OF W(K)F ALLOCATED TO G2F
F0404X	(KW,JW,IB)	FRACTION OF W(K)F ALLOCATED TO W(J)F
F0601X	(IF,IB)	FRACTION OF MAX. FEBA RATE COMMANDED FOR F(I)
P0001X	(JA,KA,IB)	PROBABILITY OF DETECTION - AA(J) AGAINST AA(K)
P0002X	(JA,KA,IB)	PROBABILITY OF KILL - AA(J) AGAINST AA(K)
P0003X	(JA,KA,IB)	PROBABILITY OF DETECTION - AA(J) AGAINST AG(K)
P0004X	(JA,KA,IB)	PROBABILITY OF KILL - AA(J) AGAINST AG(K)
P0101X	(JA,NK,IB)	KILL FACTOR - AG(J) AGAINST G1F
P0102X	(JA,NK,IB)	KILL FACTOR - AG(J) AGAINST G2F
P0103X	(JA,IB)	SSPK - AREA AIR DEFENSE AGAINST AG(J)
P0104X	(JA,IB)	TERMINAL DEFENSE PK - G1 AGAINST AG(J)
P0105X	(JA,IB)	TERMINAL DEFENSE PK - G2 AGAINST AG(J)
P0107X	(JA,IB)	TERMINAL DEFENSE PK - S AGAINST AG(J)
P0108X	(LL,JA,IB)	TERMINAL DEFENSE PK - L(L) AGAINST AG(J)
P0109X	(MB,JA,IB)	TERMINAL DEFENSE PK - B(M) AGAINST AG(J)
P0110X	(KW,JA,IB)	TERMINAL DEFENSE PK - W(K)F AGAINST A(J)G
P0301X	(LL,IB)	KILL FACTOR - M(L) AGAINST G1F
P0302X	(LL,IB)	KILL FACTOR - M(L) AGAINST G2F
P0303X	(LL,IB)	KILL FACTOR - M(L) AGAINST G1R
P0304X	(LL,IB)	KILL FACTOR - M(L) AGAINST G2R
P0305X	(LL,KL,IB)	KILL FACTOR - M(L) AGAINST L(K)
P0306X	(LL,IB)	KILL FACTOR - M(L) AGAINST S
P0307X	(LL,MB,IB)	KILL FACTOR - M(L) AGAINST A/C ON B(M)
P0308X	(LL,KW,IB)	KILL FACTOR - M(L) AGAINST W(K)F
P0309X	(LL,KW,IB)	KILL FACTOR - M(L) AGAINST W(K)R
P0323X	(JA,NK,IB)	KILL FACTOR - AG(J) AGAINST G1R
P0324X	(JA,NK,IB)	KILL FACTOR - AG(J) AGAINST G2R
P0325X	(JA,NK,IB)	KILL FACTOR - AG(J) AGAINST S
P0326X	(JA,LL,NB)	KILL FACTOR - AG(J) AGAINST L(L)
P0327X	(JA,MB,NB)	KILL FACTOR - AG(J) AGAINST A/C ON B(M)

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P0328X (JA,KW,NB)      KILL FACTOR - A(J)G AGAINST W(K)F
P0329X (JA,KW,NB)      KILL FACTOR - A(J)G AGAINST W(K)R
P0401X (IB)            KILL FACTOR - G1  AGAINST G1
P0402X (KW,IB)         KILL FACTOR - W(K)F AGAINST G1F
P0403X (KW,IB)         KILL FACTOR - W(K)F AGAINST G2F
P0404X (KW,JW,IB)      KILL FACTOR - W(K)F AGAINST W(J)F

R0001X (JA,IB)         MAX. DESIRED LAUNCH RATE FOR A(J)
R0301X (LL,IB)         MAX. DESIRED MISSILE LAUNCH RATE FOR L(L)
R0402X (KW,IB)         MAX. DESIRED LAUNCH OR FIRE RATE OF W(K)F
R0571X (JA,IB)         EXTERNAL RATE OF SUPPLY OF A(J)
R0572X (IB)            EXTERNAL RATE OF SUPPLY OF A4
R0573X (IB)            EXTERNAL RATE OF SUPPLY OF A5
R0574X (IB)            EXTERNAL RATE OF SUPPLY OF G1
R0575X (IB)            EXTERNAL RATE OF SUPPLY OF G2
R0576X (KW,IB)         EXTERNAL RATE OF SUPPLY OF W(K)
R0577X (KR,IB)         EXTERNAL RATE OF SUPPLY OF R(K)
R0578X (LM,IB)         EXTERNAL RATE OF SUPPLY OF M(L)
R0579X (LL,IB)         EXTERNAL RATE OF SUPPLY OF L(L)
R0601X                 MAXIMUM FEBA MOVEMENT RATE
R0602X (IB)            MAXIMUM RATE OF FLOW OF G1 FROM R TO F
R0603X (IB)            MAXIMUM RATE OF FLOW OF G2 FROM R TO F
R0604X (KW,IB)         MAXIMUM RATE OF FLOW OF W(K) FROM R TO F
R0605X (KR,IB)         MAXIMUM RATE OF FLOW OF R(K) FROM R TO F
R0700X (MB,IB)         REPAIR RATE PER B(M)

V0541X (LL,IB)         NOMINAL NUMBER OF M(L) AT EACH L(L)
V0545X (LL,IB)         AMOUNT OF M(L) IN TRANSIT IN R
V0551X (KR,IB)         AMOUNT OF R(K) IN TRANSIT IN R
V0601X (IF,IB)         MAXIMUM USABLE G1 IN F(I)
V0602X (KW,IF,IB)      MAXIMUM EXTRA W(K) IN F(I)
V0700X (IB)            LEVEL OF A5 CAUSING MODE SWITCH
V0     (JC,IB)         INITIAL CONDITIONS FOR COMMODITIES
V      (JC,IB)         COMMODITIES V AND DV
AV     (NA,IB)         ACQUIRED TOTALS AV AND DAV
A0001P (JA,IB)         ATTRITION AA ON A(J)A
A0002P (JA,IB)         ATTRITION AA ON A(J)G
A0101P (IF,JA,IB)      ATTRITION G1F(I) ON A(J)G
A0102P (IF,JA,IB)      ATTRITION G2F(I) ON A(J)G
A0103P (JA,IB)         ATTRITION G1R ON A(J)G
A0104P (JA,IB)         ATTRITION G2R ON A(J)G
A0105P (JA,IB)         ATTRITION S ON A(J)G
A0106P (LL,JA,IB)      ATTRITION L(L) ON A(J)G
A0107P (MB,JA,IB)      ATTRITION B(M) ON A(J)G
A0108P (IS,JA,IB)      ATTRITION W(K)F(I) ON A(J)G
A0109P (KW,JA,IB)      ATTRITION W(K)R ON A(J)G
A0301P (LL,IF,IB)      ATTRITION M(L) ON G1F(I)
A0302P (LL,IF,IB)      ATTRITION M(L) ON G2F(I)
A0303P (LL,IB)         ATTRITION M(L) ON G1R
A0304P (LL,IB)         ATTRITION M(L) ON G2R
A0305P (LL,KL,IB)      ATTRITION M(L) ON L(K)
A0306P (LL,IB)         ATTRITION M(L) ON S
A0307P (LL,JA,IB)      ATTRITION M(L) ON A(J)B1
A0308P (LL,JA,IB)      ATTRITION M(L) ON A(J)B2
A0309P (LM,IS,IB)      ATTRITION M(L) ON W(K)F(I)
A0310P (LM,KW,IB)      ATTRITION M(L) ON W(K)R
A0321P (JA,IF,IB)      ATTRITION A(J)G ON G1F(I)
A0322P (JA,IF,IB)      ATTRITION A(J)G ON G2F(I)
A0323P (JA,IB)         ATTRITION A(J)G ON G1R
A0324P (JA,IB)         ATTRITION A(J)G ON G2R
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A0325P	(JA,IB)	ATTRITION A(J)G ON S
A0326P	(JA,LL,IB)	ATTRITION A(J)G ON L(L)
A0327P	(JA,KA,IB)	ATTRITION A(J)G ON A(I)B1
A0328P	(JA,KA,IB)	ATTRITION A(J)G ON A(I)B2
A0329P	(JA,IS,IB)	ATTRITION A(J)G ON W(K)F(I)
A0330P	(JA,KW,IB)	ATTRITION A(J)G ON W(K)R
A0401P	(IF,IB)	ATTRITION G1F(I) ON G1F(I)
A0402P	(KR,IF,IB)	ATTRITION R(K)F(I) ON G1F(I)
A0403P	(KR,IF,IB)	ATTRITION R(K)F(I) ON G2F(I)
A0404P	(KR,IS,IB)	ATTRITION R(K)F(I) ON W(J)F(I)
A0501P	(IF,IB)	TOTAL DIRECT ATTRITION G1F(I)
A0502P	(KW,IF,IB)	TOTAL DIRECT ATTRITION ON W(K)F(I)
A0503P	(KW,IB)	TOTAL DIRECT ATTRITION ON W(K)R
A0511P	(JA,IB)	ATTRITION AA ON A(J)
A0512P	(JA,IB)	TOTAL DIRECT ATTRITION ON A(J)GS
A0513P	(JA,IB)	TOTAL DIRECT ATTRITION ON A(J)B
A0514P	(JA,IB)	TOTAL DIRECT ATTRITION ON A(J)
A0515P	(IB)	ASSOCIATED ATTRITION AB ON A4
A0516P	(IB)	ASSOCIATED ATTRITION AB ON A5
A0521P	(IF,IB)	TOTAL DIRECT ATTRITION ON G2F(I)
A0522P	(IF,IB)	ASSOCIATED ATTRITION G1F(I) ON G2F(I)
A0523P	(KW,IF,IB)	ASSOCIATED ATTRITION G1F(I) ON W(K)F(I)
A0531P	(IB)	TOTAL DIRECT ATTRITION ON G1R
A0532P	(IB)	TOTAL DIRECT ATTRITION ON G2R
A0533P	(IB)	ASSOCIATED ATTRITION G1R ON G2R
A0534P	(KW,IB)	ASSOCIATED ATTRITION G1R ON W(K)R
A0540P	(IB)	TOTAL S ATTRITION
A0541P	(LL,IB)	TOTAL DIRECT ATTRITION ON L(L)
A0542P	(LL,IB)	ASSOCIATED ATTRITION L(L) ON M(L)
A0543P	(LL,IB)	ASSOCIATED ATTRITION SITE ON M(L)
A0544P	(LM,IB)	G2R ASSOCIATED ATTRITION OF M(L)
A0551P	(KR,IF,IB)	ASSOCIATED ATTRITION G2F(I) ON R(K)F(I)
A0561P	(KR,IB)	ASSOCIATED ATTRITION G2R ON R(K)R
A0571P	(KR,IF,IB)	ASSOCIATED ATTRITION W(K)F(I) ON R(K)F(I)
A0572P	(KR,IB)	ASSOCIATED ATTRITION W(K)R ON R(K)R
A0573P	(KR,IB)	ASSOCIATED ATTRITION S ON R(K)R

E0511P	(IB)	EXPENDITURE RATE OF A4
E0512P	(IB)	EXPENDITURE RATE OF A5
E0521P	(IF,IB)	EXPENDITURE RATE OF G2F(I)
E0551P	(KR,IF,IB)	EXPENDITURE RATE OF R(K)F(I)

R0001P	(JA,IB)	RATE EA(J)T
R0002P	(JA,IB)	RATE EA(J)A
R0003P	(JA,IB)	RATE EA(J)G
R0004P	(JA,IB)	RATE EA(J)GS
R0005P	(IB)	RATE FAT
R0301P	(LM,IF,IB)	FLOW M(L) AGAINST G1 IN F(I)
R0302P	(LM,IF,IB)	FLOW M(L) AGAINST G2 IN F(I)
R0303P	(LM,IB)	FLOW M(L) AGAINST G1R
R0304P	(LM,IB)	FLOW M(L) AGAINST G2R
R0305P	(LM,KL,IB)	FLOW M(L) AGAINST L(K)
R0306P	(LM,IB)	FLOW M(L) AGAINST M(K)
R0307P	(LM,MB,IB)	FLOW M(L) AGAINST B(M)
R0308P	(LM,IS,IB)	FLOW M(L) AGAINST W(K)F(I)
R0309P	(LM,KW,IB)	FLOW M(L) AGAINST W(K)R
R0321P	(JA,IF,IB)	FLOW OF AG(J) AGAINST G1F(I)
R0322P	(JA,IF,IB)	FLOW OF AG(J) AGAINST G2F(I)
R0323P	(JA,IB)	FLOW OF AG(J) AGAINST G1R
R0324P	(JA,IB)	FLOW OF AG(J) AGAINST G2R

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R0325P  (JA,IB)           FLOW OF AG(J) AGAINST S
R0326P  (JA,LL,IB)        FLOW OF AG(J) AGAINST L(L)
R0327P  (JA,MB,IB)        FLOW OF AG(J) AGAINST B(M)
R0328P  (JA,IS,IB)        FLOW OF A(J)G AGAINST W(K)F(I)
R0329P  (JA,KW,IB)        FLOW OF A(J)G AGAINST W(K)R
R0402P  (KR,IF,IB)        FLOW OF R(K)F(I) AGAINST G1F(I)
R0403P  (KR,IF,IB)        FLOW OF R(K)F(I) AGAINST G2F(I)
R0404P  (KR,IS,IB)        FLOW OF R(K)F(I) AGAINST W(J)F(I)
R0541P  (LL,IB)           TOTAL FLOW M(L) FROM R
R0571P  (JA,IB)           EXTERNAL RATE OF SUPPLY OF A(J)
R0572P  (IB)              EXTERNAL RATE OF SUPPLY OF A4
R0573P  (IB)              EXTERNAL RATE OF SUPPLY OF A5
R0574P  (IB)              EXTERNAL RATE OF SUPPLY OF G1
R0575P  (IB)              EXTERNAL RATE OF SUPPLY OF G2
R0576P  (KW,IB)           EXTERNAL RATE OF SUPPLY OF W(K)
R0577P  (KR,IB)           EXTERNAL RATE OF SUPPLY OF R(K)
R0578P  (LM,IB)           EXTERNAL RATE OF SUPPLY OF M(L)
R0579P  (LL,IB)           EXTERNAL RATE OF SUPPLY OF L(L)
R0601P  (IF,IB)           FLOW OF G1R TO F(I)
R0602P  (IF,IB)           FLOW OF G2R TO F(I)
R0603P  (KW,IF,IB)        FLOW OF W(K)R TO F(I)
R0604P  (KR,IF,IB)        FLOW OF R(K)R TO F(I)

C0001P  (JA,KA,IB)        A(J)A SURVIVAL PROBABILITY AGAINST A(K)A
C0002P  (JA,KA,IB)        A(J)G SURVIVAL PROBABILITY AGAINST A(K)A
C0003P  (MB,IB)           DEGRADATION FACTOR AT B(M)
C0004P  (JA,IB)           A(J) LAUNCH RATE DEGRADATION
C0601P  (IF,IB)           R FACTOR FOR F(I) FEBA MOVEMENT

D0601P  (IF,IB)           DEMAND FOR G1R FROM F(I)
D0602P  (IF,IB)           DEMAND FOR G2R FROM F(I)
D0603P  (KW,IF,IB)        DEMAND FOR W(K) FROM F(I)
D0604P  (KR,IF,IB)        DEMAND FOR R(K) FROM F(I)

F0101P  (JA,IF,IB)         FRACTION OF AF(J) TO F(I)
F0103P  (JA,IF,IB)         FRACTION OF A(J)GS TO G1F(I)
F0105P  (JA,IF,IB)         FRACTION OF A(J)GS TO G2F(I)
F0106P  (JA,IB)            FRACTION OF A(J)GS TO G1R
F0107P  (JA,IB)            FRACTION OF A(J)GS TO G2R
F0108P  (JA,IB)           FRACTION OF A(J)GS TO S
F0109P  (JA,LL,IB)         FRACTION OF A(J)GS TO L(L)
F0110P  (JA,MB,IB)        FRACTION OF A(J)GS TO B(M)
F0112P  (JA,IS,IB)        FRACTION OF A(J)GS TO W(K)F(I)
F0113P  (JA,KW,IB)        FRACTION OF A(J)GS TO W(K)R
F0301P  (LL,IF,IB)        FRACTION L(L)F(I) TO G1
F0302P  (LL,IF,IB)        FRACTION L(L)F(I) TO G2
F0303P  (LL,IB)           FRACTION L(L)R TO G1
F0304P  (LL,IB)           FRACTION L(L)R TO G2
F0305P  (LL,KL,IB)        FRACTION L(L)R TO L(K)
F0306P  (LL,IB)           FRACTION L(L) TO S
F0307P  (LL,MB,IB)        FRACTION L(L)R TO B(M)
F0308P  (LL,IS,IB)        FRACTION OF L(L)F(I) TO W(K)F(I)
F0309P  (LL,KW,IB)        FRACTION OF L(L) TO W(K)R

P0101P  (JA,IF,IB)        ACQUISITION FACTOR A(J)G ON G1F(I)
P0102P  (JA,IF,IB)        ACQUISITION FACTOR A(J)G ON G2F(I)
P0103P  (IF,JA,IB)        KILL FACTOR - G1F(I) AGAINST A(J)G
P0104P  (IF,JA,IB)        KILL FACTOR - G2F(I) AGAINST A(J)G
P0105P  (JA,IB)           KILL FACTOR - REAR AREA AGAINST A(J)G
P0106P  (JA,IB)           ACQUISITION FACTOR A(J)G ON G1R
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P0108P (JA,IB)          ACQUISITION FACTOR A(J)G ON G2R
P0110P (JA,LL,IB)       ACQUISITION FACTOR FOR A(J)G ON L(L)
P0111P (JA,IS,IB)       ACQUISITION FACTOR FOR A(J)G ON W(K)F(I)
P0112P (IS,JA,IB)       KILL FACTOR - W(K)F(I) AGAINST A(J)G
P0113P (JA,KW,IB)       ACQUISITION FACTOR FOR A(J)G ON W(K)R
P0301P (LL,IF,IB)       ACQUISITION FACTOR L(L) ON G1F(I)
P0302P (LL,IF,IB)       ACQUISITION FACTOR L(L) ON G2F(I)
P0303P (LL,IB)          ACQUISITION FACTOR L(L) ON G1R
P0304P (LL,IB)          ACQUISITION FACTOR L(L) ON G2R
P0305P (LL,KL,IB)       ACQUISITION FACTOR L(L) ON L(K)
P0306P (LL,IS,IB)       ACQUISITION FACTOR FOR L(L) ON W(K)F(I)
P0307P (LL,KW,IB)       ACQUISITION FACTOR FOR L(L) ON W(K)R
P0402P (KW,IF,IB)       ACQUISITION FACTOR FOR W(K)F(I) ON G1F(I)
P0403P (KW,IF,IB)       ACQUISITION FACTOR FOR W(K)F(I) ON G2F(I)
P0404P (KW,IS,IB)       ACQUISITION FACTOR FOR W(K)F(I) ON W(J)F(I)

V0301P (MB,IB)          TOTAL NUMBER OF A/C ON B(M)
V0541P (LM,IB)          NUMBER OF M(L) PER L(L)
V0542P (LM,IB)          NUMBER OF M(L) IN SITES
V0545P (LM,IB)          NUMBER OF M(L) IN TRANSIT
V0546P (KR,IF,IB)       NUMBER OF R(K) PER W(K)F(I)
V0547P (KR,IB)          NUMBER OF R(K) PER W(K)R
V0548P (KR,IF,IB)       NUMBER OF R(K) IN TRANSIT IN F(I)
V0549P (KR,IB)          NUMBER OF R(K) IN TRANSIT IN R
V0601P (IF,IB)          DESIRED AMOUNT OF G2 AT F(I)
V0550P (KR,IB)          NUMBER OF R(K) IN SITES
V0602P (KW,IF,IB)       MAXIMUM DESIRED W(K) IN F(I)
V0603P (KR,IF,IB)       MAXIMUM DESIRED R(K) IN F(I)
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TITLE1         GROUND FORCE PACKETS %G1<
V0       1     GROUND FORCES IN FRONT 1
V0       2                   IN FRONT 2
V0       3                   IN FRONT 3
V0       4                   IN THE REAR
R0574X         RATE OF EXTERNAL SUPPLY OF GROUND FORCES
R0602X         MAXIMUM FLOW RATE OF G1 BETWEEN R AND F PER G1R
P0401X         PROBABILITY OF KILL FOR GROUND FORCES VS. OPPOSING GROUND FORCES
F0521X         GROUND FORCE EXPENDITURE RATE OF SUPPLY PACKETS
V0601X 1       MAXIMUM ALLOWABLE GROUND FORCE PACKETS IN FRONT 1
V0601X 2                                              IN FRONT 2
V0601X 3                                              IN FRONT 3
TITLE2         FEBA MOVEMENT %F AND R<
V0      63     CO-ORDINATES OF FRONT 1
V0      64                  OF FRONT 2
V0      65                  OF FRONT 3
R0601X-5       MAXIMUM FEBA ADVANCE RATE
F0601X 1       FRACTION OF THE MAX FEBA RATE USED FOR FRONT 1
F0601X 2       FRACTION OF FRONT 1-S FEBA RATE USED FOR FRONT 2
F0601X 3                                           FOR FRONT 3
C0601X-5       SHAPING FACTOR FOR FEBA MOVEMENT
TITLE2         SUPPLY PACKETS %G2<
V0      27     SUPPLIES IN FRONT 1
V0      28              IN FRONT 2
V0      29              IN FRONT 3
V0      30              IN THE REAR
R0575X         RATE OF EXTERNAL SUPPLY OF SUPPLY PACKETS
R0603X         MAXIMUM FLOW RATE OF SUPPLIES BETWEEN R AND F PER REAR SUPPLY PACKET
C0606X         NUMBER OF SUPPLY PACKETS ASSOCIATED WITH EACH GROUND FORCE PACKET
C0521X         LOSS RATE OF ASSOCIATED SUPPLIES PER LOSS OF GROUND FORCE PACKET
TITLE1         AIR BASE %B1 AND B2<
V0      54     NUMBER OF FORWARD AIR BASES %B1<
V0      56     STATE OF REPAIR FOR THE FORWARD BASES
R0700X 1       REPAIR RATE FOR THE FORWARD BASES
V0      55     NUMBER OF LONG RANGE BASES %B2<
V0      57     STATE OF REPAIR FOR THE LONG RANGE BASES
R0700X 2       REPAIR RATE FOR THE L-R BASES
SPACE
V0      61     NUMBER OF CONVENTIONAL LOADS FOR AIRCRAFT %A4<
R0572X         RATE OF EXTERNAL SUPPLY OF CONVENTIONAL MUNITIONS
V0      62     NUMBER OF NUCLEAR LOADS FOR AIRCRAFT %A5<
R0573X         RATE OF EXTERNAL SUPPLY OF NUCLEAR MUNITIONS
V0700X         PERCENTAGE OF NUCLEAR WEAPONS REMAINING NEEDED FOR NUCLEAR SORTIES
C0511X         CONVENTIONAL MUNITIONS LOST PER INTERCEPTER LOST ON THE GROUND
C0512X 1       NUC WEAPONS LOST PER F-B IN A NUCLEAR ROLE LOST ON THE GROUND
C0512X 2       CONV WEAPONS LOST PER F-B IN A CONVENTIONAL ROLE LOST ON THE GROUND
C0513X 1       NUC WEAPONS LOST PER LRA IN A NUCLEAR ROLE LOST ON THE GROUND
C0513X 2       CONV WEAPONS LOST PER LRA IN A CONVENTIONAL ROLE LOST ON THE GROUND
TITLE2         MUNITION STORAGE SITES %S<
V0      53     NUMBER OF SITES
TITLE1         CENTRAL COMMAND ACQUISTION SYSTEM
C0010X         FRONTAL GROUND FORCES:INITIAL PERCENT OF KNOWLEDGE
C0251X                               FRACTIONAL RATE OF ACQUISITION
C0261X                               FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0020X         FRONTAL SUPPLY PACKETS:INITIAL PERCENT OF KNOWLEDGE
C0252X                                FRACTIONAL RATE OF AQUISITION
C0262X                                FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0030X         REAR GROUND FORCES:INITIAL PERCENT OF KNOWLEDGE
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C0253X                         FRACTIONAL RATE OF ACQUISITION
C0263X                         FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0040X        REAR SUPPLY PACKETS:INITIAL PERCENT OF KNOWLEDGE
C0254X                          FRACTIONAL RATE OF ACQUISITION
C0264X                          FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0060X 1      SHORT RANGE WEAPON SYSTEM 1-F:INITIAL PERCENT OF KNOWLEDGE
C0256X 1                                    FRACTIONAL RATE OF ACQUISITION
C0266X 1                                    FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0060X 2      SHORT RANGE WEAPON SYSTEM 2-F:INITIAL PERCENT OF KNOWLEDGE
C0256X 2                                    FRACTIONAL RATE OF ACQUISITION
C0266X 2                                    FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0060X 3      SHORT RANGE WEAPON SYSTEM 3-F:INITIAL PERCENT OF KNOWLEDGE
C0256X 3                                    FRACTIONAL RATE OF ACQUISITION
C0266X 3                                    FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0060X 4      SHORT RANGE WEAPON SYSTEM 4-F:INITIAL PERCENT OF KNOWLEDGE
C0256X 4                                    FRACTIONAL RATE OF ACQUISITION
C0266X 4                                    FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0060X 5      SHORT RANGE WEAPON SYSTEM 5-F:INITIAL PERCENT OF KNOWLEDGE
C0256X 5                                    FRACTIONAL RATE OF ACQUISITION
C0266X 5                                    FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0070X 1      SHORT RANGE WEAPON SYSTEM 1-R:INITIAL PERCENT OF KNOWLEDGE
C0257X 1                                    FRACTIONAL RATE OF ACQUISITION
C0267X 1                                    FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0070X 2      SHORT RANGE WEAPON SYSTEM 2-R:INITIAL PERCENT OF KNOWLEDGE
C0257X 2                                    FRACTIONAL RATE OF ACQUISITION
C0267X 2                                    FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0070X 3      SHORT RANGE WEAPON SYSTEM 3-R:INITIAL PERCENT OF KNOWLEDGE
C0257X 3                                    FRACTIONAL RATE OF ACQUISITION
C0267X 3                                    FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0070X 4      SHORT RANGE WEAPON SYSTEM 4-R:INITIAL PERCENT OF KNOWLEDGE
C0257X 4                                    FRACTIONAL RATE OF ACQUISITION
C0267X 4                                    FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0070X 5      SHORT RANGE WEAPON SYSTEM 5-R:INITIAL PERCENT OF KNOWLEDGE
C0257X 5                                    FRACTIONAL RATE OF ACQUISITION
C0267X 5                                    FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0050X 1      LONG RANGE WEAPON SYSTEM 1:INITIAL PERCENT OF KNOWLEDGE
C0255X 1                                 FRACTIONAL RATE OF ACQUISITION
C0265X 1                                 FRACTIONAL RATE OF LOSS OF KNOWLEDGE
C0050X 2      LONG RANGE WEAPON SYSTEM 2:INITIAL PERCENT OF KNOWLEDGE
C0255X 2                                 FRACTIONAL RATE OF ACQUISITION
C0265X 2                                 FRACTIONAL RATE OF LOSS OF KNOWLEDGE
TITLE2        LOGISTIC DEMAND AND SUPPLY
C0604X        DEMAND SCALE FACTOR
C0605X        DEMAND RESPONSE UNIT CONVERSION FACTOR
C0522X        MAXIMUM DESIRABLE SUPPLY PACKETS PER FRONTAL GROUND FORCE UNIT
C0603X 1      RATIO-FRONT 1 GROUND FORCE LOSSES TO DEMAND
C0603X 2      RATIO-FRONT 2 GROUND FORCE LOSSES TO DEMAND
C0603X 3      RATIO-FRONT 3 GROUND FORCE LOSSES TO DEMAND
C0607X        RATIO-LOSS/EXPENDITURE TO REPLACEMENT FOR FRONTAL SUPPLIES
C0611X 1      RATIO-RAPLACEMENT TO LOSS FOR S-R WEAPON SYSTEM 1
C0611X 2                                FOR S-R WEAPON SYSTEM 2
C0611X 3                                FOR S-R WEAPON SYSTEM 3
C0611X 4                                FOR S-R WEAPON SYSTEM 4
C0611X 5                                FOR S-R WEAPON SYSTEM 5
C0612X 1      RATIO-REPLACEMENT TO LOSS OF MUNITIONS FOR S-R WEAPON SYSTEM 1
C0612X 2                                             FOR S-R WEAPON SYSTEM 2
C0612X 3                                             FOR S-R WEAPON SYSTEM 3
C0612X 4                                             FOR S-R WEAPON SYSTEM 4
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C0612X 5                                             FOR S-R WEAPON SYSTEM 5
TITLE1        AIR DEFENSES
P0103X 1      SINGLE SHOT PK FOR AREA AIR DEFENSE AGAINST A1G
P0103X 2                                                  A2G
P0103X 3                                                  A3G
F0102X        FRACTION OF AREA AIR DEFENSE SEEN BY THE FRONTAL FORCES ATTACKERS
F0103X                                          BY THE FRONTAL SUPPLY ATTACKERS
F0110X 1                                        BY S-R WEAPON SYSTEM 1-F ATTACKERS
F0110X 2                                        BY S-R WEAPON SYSTEM 2-F ATTACKERS
F0110X 3                                        BY S-R WEAPON SYSTEM 3-F ATTACKERS
F0110X 4                                        BY S-R WEAPON SYSTEM 4-F ATTACKERS
F0110X 5                                        BY S-R WEAPON SYSTEM 5-F ATTACKERS
F0109X                                          BY REAR AREA ATTACKERS
P0104X 1      PK FOR TERMINAL AIR DEFENSE OF GROUND FORCES AGAINST A1G
P0104X 2                                                       A2G
P0104X 3                                                       A3G
P0105X 1                                 OF SUPPLY PACKETS AGAINST A1G
P0105X 2                                                           A2G
P0105X 3                                                           A3G
P0110X 1 1                               OF S-R WEAPON SYSTEM 1   AGAINST A1G
P0110X 1 2                                                                A2G
P0110X 1 3                                                                A3G
P0110X 2 1                               OF S-R WEAPON SYSTEM 2   AGAINST A1G
P0110X 2 2                                                                A2G
P0110X 2 3                                                                A3G
P0110X 3 1                               OF S-R WEAPON SYSTEM 3   AGAINST A1G
P0110X 3 2                                                                A2G
P0110X 3 3                                                                A3G
P0110X 4 1                               OF S-R WEAPON SYSTEM 4   AGAINST A1G
P0110X 4 2                                                                A2G
P0110X 4 3                                                                A3G
P0110X 5 1                               OF S-R WEAPON SYSTEM 5   AGAINST A1G
P0110X 5 2                                                                A2G
P0110X 5 3                                                                A3G
P0107X 1                                 OF STORAGE SITES AGAINST A1G
P0107X 2                                                          A2G
P0107X 3                                                          A3G
P0108X 1 1                               OF L-R WEAPON SYSTEM 1 AGAINST A1G
P0108X 1 2                                                              A2G
P0108X 1 3                                                              A3G
P0108X 2 1                               OF L-R WEAPON SYSTEM 2 AGAINST A1G
P0108X 2 2                                                              A2G
P0108X 2 3                                                              A3G
P0109X 1 1                               OF FORWARD BASES AGAINST A1G
P0109X 1 2                                                        A2G
P0109X 1 3                                                        A3G
P0109X 2 1                               OF LONG RANGE BASES AGAINST A1G
P0109X 2 2                                                           A2G
P0109X 2 3                                                           A3G
TITLE1        SHORT RANGE WEAPON SYSTEM 1
TITLE2        SYSTEM   %W1 AND R1<
V0       5    NUMBER OF WEAPONS %W1< IN FRONT 1
V0       6                           IN FRONT 2
V0       7                           IN FRONT 3
V0      20                           IN THE REAR
C0523X 1      MAXIMUM NUMBER OF WEAPONS PER GROUND FORCE PACKET
V0602X 1 1    MAXIMUM EXTRA WEAPONS IN FRONT 1
V0602X 1 2                          IN FRONT 2
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V0602X 1 3                     IN FRONT 3
R0576X 1   RATE OF EXTERNAL SUPPLY OF WEAPONS
R0604X 1   MAXIMUM FLOW RATE OF WEAPONS BETWEEN THE REAR AND THE FRONT PER W1R
R0402X 1   MAXIMUM FIRE RATE PER WEAPON
F0402X 1   FRACTION OF FRONTAL WEAPONS ALLOCATED AGAINST GROUND FORCES
F0403X 1                                     AGAINST SUPPLY PACKETS
F0404X 1 1                                   AGAINST S-R WEAPON SYSTEM 1
F0404X 1 2                                   AGAINST S-R WEAPON SYSTEM 2
F0404X 1 3                                   AGAINST S-R WEAPON SYSTEM 3
F0404X 1 4                                   AGAINST S-R WEAPON SYSTEM 4
F0404X 1 5                                   AGAINST S-R WEAPON SYSTEM 5
C0242X 1   FRACTION OF FRONTAL FORCES WITHIN WEAPON-S RANGE
C0243X 1             FRONTAL SUPPLIES
C0244X 1 1           S-R WEAPON SYSTEM 1
C0244X 1 2           S-R WEAPON SYSTEM 2
C0244X 1 3           S-R WEAPON SYSTEM 3
C0244X 1 4           S-R WEAPON SYSTEM 4
C0244X 1 5           S-R WEAPON SYSTEM 5
P0402X 1   WEAPON-S PK ON FRONTAL FORCES
P0403X 1                 FRONTAL SUPPLIES
P0404X 1 1               S-R WEAPON SYSTEM 1
P0404X 1 2               S-R WEAPON SYSTEM 2
P0404X 1 3               S-R WEAPON SYSTEM 3
P0404X 1 4               S-R WEAPON SYSTEM 4
P0404X 1 5               S-R WEAPON SYSTEM 5
SPACE
V0     31  NUMBER OF ROUNDS %R1< IN FRONT 1
V0     32                        IN FRONT 2
V0     33                        IN FRONT 3
V0     46                        IN THE REAR
C0610X 1   MAXIMUM NUMBER OF ROUNDS PER WEAPON
R0577X 1   EXTERNAL RATE OF SUPPLY OF ROUNDS
R0605X 1   MAXIMUM FLOW RATE OF ROUNDS BETWEEN THE REAR AND THE FRONT PER R1R
V0551X 1   MAXIMUM NUMBER IN TRANSIT IN THE REAR
TITLE1     SHORT RANGE WEAPON SYSTEM 2
TITLE2     SYSTEM   %W2 AND R2<
V0      8  NUMBER OF WEAPONS %W2< IN FRONT 1
V0      9                         IN FRONT 2
V0     10                         IN FRONT 3
V0     21                         IN THE REAR
C0523X 2   MAXIMUM NUMBER OF WEAPONS PER GROUND FORCE PACKET
V0602X 2 1 MAXIMUM EXTRA WEAPONS IN FRONT 1
V0602X 2 2                     IN FRONT 2
V0602X 2 3                     IN FRONT 3
R0576X 2   RATE OF EXTERNAL SUPPLY OF WEAPONS
R0604X 2   MAXIMUM FLOW RATE OF WEAPONS BETWEEN THE REAR AND THE FRONT PER W2R
R0402X 2   MAXIMUM FIRE RATE PER WEAPON
F0402X 2   FRACTION OF FRONTAL WEAPONS ALLOCATED AGAINST GROUND FORCES
F0403X 2                                     AGAINST SUPPLY PACKETS
F0404X 2 1                                   AGAINST S-R WEAPON SYSTEM 1
F0404X 2 2                                   AGAINST S-R WEAPON SYSTEM 2
F0404X 2 3                                   AGAINST S-R WEAPON SYSTEM 3
F0404X 2 4                                   AGAINST S-R WEAPON SYSTEM 4
F0404X 2 5                                   AGAINST S-R WEAPON SYSTEM 5
C0242X 2   FRACTION OF FRONTAL FORCES WITHIN WEAPON-S RANGE
C0243X 2             FRONTAL SUPPLIES
C0244X 2 1           S-R WEAPON SYSTEM 1
C0244X 2 2           S-R WEAPON SYSTEM 2
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C0244X 2 3              S-R WEAPON SYSTEM 3
C0244X 2 4              S-R WEAPON SYSTEM 4
C0244X 2 5              S-R WEAPON SYSTEM 5
P0402X 2     WEAPON-S PK ON FRONTAL FORCES
P0403X 2                    FRONTAL SUPPLIES
P0404X 2 1                  S-R WEAPON SYSTEM 1
P0404X 2 2                  S-R WEAPON SYSTEM 2
P0404X 2 3                  S-R WEAPON SYSTEM 3
P0404X 2 4                  S-R WEAPON SYSTEM 4
P0404X 2 5                  S-R WEAPON SYSTEM 5
SPACE
VO      34   NUMBER OF ROUNDS %R2< IN FRONT 1
VO      35                         IN FRONT 2
VO      36                         IN FRONT 3
VO      47                         IN THE REAR
C0610X 2     MAXIMUM NUMBER OF ROUNDS PER WEAPON
R0577X 2     EXTERNAL RATE OF SUPPLY OF ROUNDS
R0605X 2     MAXIMUM FLOW RATE OF ROUNDS BETWEEN THE REAR AND THE FRONT PER R2R
V0551X 2     MAXIMUM NUMBER IN TRANSIT IN THE REAR
TITLE1       SHORT RANGE WEAPON SYSTEM 3
TITLE2       SYSTEM   %W3 AND R3<
VO      11   NUMBER OF WEAPONS %W3< IN FRONT 1
VO      12                          IN FRONT 2
VO      13                          IN FRONT 3
VO      22                          IN THE REAR
C0523X 3     MAXIMUM NUMBER OF WEAPONS PER GROUND FORCE PACKET
V0602X 3 1   MAXIMUM EXTRA WEAPONS IN FRONT 1
V0602X 3 2                         IN FRONT 2
V0602X 3 3                         IN FRONT 3
R0576X 3     RATE OF EXTERNAL SUPPLY OF WEAPONS
R0604X 3     MAXIMUM FLOW RATE OF WEAPONS BETWEEN THE REAR AND THE FRONT PER W3R
R0402X 3     MAXIMUM FIRE RATE PER WEAPON
F0402X 3     FRACTION OF FRONTAL WEAPONS ALLOCATED AGAINST GROUND FORCES
F0403X 3                                           AGAINST SUPPLY PACKETS
F0404X 3 1                                         AGAINST S-R WEAPON SYSTEM 1
F0404X 3 2                                         AGAINST S-R WEAPON SYSTEM 2
F0404X 3 3                                         AGAINST S-R WEAPON SYSTEM 3
F0404X 3 4                                         AGAINST S-R WEAPON SYSTEM 4
F0404X 3 5                                         AGAINST S-R WEAPON SYSTEM 5
C0242X 3     FRACTION OF FRONTAL FORCES WITHIN WEAPON-S RANGE
C0243X 3                FRONTAL SUPPLIES
C0244X 3 1              S-R WEAPON SYSTEM 1
C0244X 3 2              S-R WEAPON SYSTEM 2
C0244X 3 3              S-R WEAPON SYSTEM 3
C0244X 3 4              S-R WEAPON SYSTEM 4
C0244X 3 5              S-R WEAPON SYSTEM 5
P0402X 3     WEAPON-S PK ON FRONTAL FORCES
P0403X 3                    FRONTAL SUPPLIES
P0404X 3 1                  S-R WEAPON SYSTEM 1
P0404X 3 2                  S-R WEAPON SYSTEM 2
P0404X 3 3                  S-R WEAPON SYSTEM 3
P0404X 3 4                  S-R WEAPON SYSTEM 4
P0404X 3 5                  S-R WEAPON SYSTEM 5
SPACE
VO      37   NUMBER OF ROUNDS %R3< IN FRONT 1
VO      38                         IN FRONT 2
VO      39                         IN FRONT 3
VO      48                         IN THE REAR
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C0610X 3      MAXIMUM NUMBER OF ROUNDS PER WEAPON
R0577X 3      EXTERNAL RATE OF SUPPLY OF ROUNDS
R0605X 3      MAXIMUM FLOW RATE OF ROUNDS BETWEEN THE REAR AND THE FRONT PER R3R
V0551X 3      MAXIMUM NUMBER IN TRANSIT IN THE REAR
TITLE1        SHORT RANGE WEAPON SYSTEM 4
TITLE2        SYSTEM   %W4 AND R4<
VO      14    NUMBER OF WEAPONS %W4< IN FRONT 1
VO      15                          IN FRONT 2
VO      16                          IN FRONT 3
VO      23                          IN THE REAR
C0523X 4      MAXIMUM NUMBER OF WEAPONS PER GROUND FORCE PACKET
V0602X 4 1    MAXIMUM EXTRA WEAPONS IN FRONT 1
V0602X 4 2                          IN FRONT 2
V0602X 4 3                          IN FRONT 3
R0576X 4      RATE OF EXTERNAL SUPPLY OF WEAPONS
R0604X 4      MAXIMUM FLOW RATE OF WEAPONS BETWEEN THE REAR AND THE FRONT PER W4R
R0402X 4      MAXIMUM FIRE RATE PER WEAPON
F0402X 4      FRACTION OF FRONTAL WEAPONS ALLOCATED AGAINST GROUND FORCES
F0403X 4                                          AGAINST SUPPLY PACKETS
F0404X 4 1                                        AGAINST S-R WEAPON SYSTEM 1
F0404X 4 2                                        AGAINST S-R WEAPON SYSTEM 2
F0404X 4 3                                        AGAINST S-R WEAPON SYSTEM 3
F0404X 4 4                                        AGAINST S-R WEAPON SYSTEM 4
F0404X 4 5                                        AGAINST S-R WEAPON SYSTEM 5
C0242X 4      FRACTION OF FRONTAL FORCES WITHIN WEAPON-S RANGE
C0243X 4                 FRONTAL SUPPLIES
C0244X 4 1               S-R WEAPON SYSTEM 1
C0244X 4 2               S-R WEAPON SYSTEM 2
C0244X 4 3               S-R WEAPON SYSTEM 3
C0244X 4 4               S-R WEAPON SYSTEM 4
C0244X 4 5               S-R WEAPON SYSTEM 5
P0402X 4      WEAPON-S PK ON FRONTAL FORCES
P0403X 4                     FRONTAL SUPPLIES
P0404X 4 1                   S-R WEAPON SYSTEM 1
P0404X 4 2                   S-R WEAPON SYSTEM 2
P0404X 4 3                   S-R WEAPON SYSTEM 3
P0404X 4 4                   S-R WEAPON SYSTEM 4
P0404X 4 5                   S-R WEAPON SYSTEM 5
SPACE
VO      40    NUMBER OF ROUNDS %R4< IN FRONT 1
VO      41                          IN FRONT 2
VO      42                          IN FRONT 3
VO      49                          IN THE REAR
C0610X 4      MAXIMUM NUMBER OF ROUNDS PER WEAPON
R0577X 4      EXTERNAL RATE OF SUPPLY OF ROUNDS
R0605X 4      MAXIMUM FLOW RATE OF ROUNDS BETWEEN THE REAR AND THE FRONT PER R4R
V0551X 4      MAXIMUM NUMBER IN TRANSIT IN THE REAR
TITLE1        SHORT RANGE WEAPON SYSTEM 5
TITLE2        SYSTEM   %W5 AND R5<
VO      17    NUMBER OF WEAPONS %W5< IN FRONT 1
VO      18                          IN FRONT 2
VO      19                          IN FRONT 3
VO      24                          IN THE REAR
C0523X 5      MAXIMUM NUMBER OF WEAPONS PER GROUND FORCE PACKET
V0602X 5 1    MAXIMUM EXTRA WEAPONS IN FRONT 1
V0602X 5 2                          IN FRONT 2
V0602X 5 3                          IN FRONT 3
R0576X 5      RATE OF EXTERNAL SUPPLY OF WEAPONS
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R0604X 5      MAXIMUM FLOW RATE OF WEAPONS BETWEEN THE REAR AND THE FRONT PER W5R
R0402X 5      MAXIMUM FIRE RATE PER WEAPON
F0402X 5      FRACTION OF FRONTAL WEAPONS ALLOCATED AGAINST GROUND FORCES
F0403X 5                                            AGAINST SUPPLY PACKETS
F0404X 5 1                                          AGAINST S-R WEAPON SYSTEM 1
F0404X 5 2                                          AGAINST S-R WEAPON SYSTEM 2
F0404X 5 3                                          AGAINST S-R WEAPON SYSTEM 3
F0404X 5 4                                          AGAINST S-R WEAPON SYSTEM 4
F0404X 5 5                                          AGAINST S-R WEAPON SYSTEM 5
C0242X 5      FRACTION OF FRONTAL FORCES WITHIN WEAPON-S RANGE
C0243X 5                 FRONTAL SUPPLIES
C0244X 5 1               S-R WEAPON SYSTEM 1
C0244X 5 2               S-R WEAPON SYSTEM 2
C0244X 5 3               S-R WEAPON SYSTEM 3
C0244X 5 4               S-R WEAPON SYSTEM 4
C0244X 5 5               S-R WEAPON SYSTEM 5
P0402X 5      WEAPON-S PK ON FRONTAL FORCES
P0403X 5                     FRONTAL SUPPLIES
P0404X 5 1                   S-R WEAPON SYSTEM 1
P0404X 5 2                   S-R WEAPON SYSTEM 2
P0404X 5 3                   S-R WEAPON SYSTEM 3
P0404X 5 4                   S-R WEAPON SYSTEM 4
P0404X 5 5                   S-R WEAPON SYSTEM 5
SPACE
V0     43     NUMBER OF ROUNDS %R5< IN FRONT 1
V0     44                           IN FRONT 2
V0     45                           IN FRONT 3
V0     50                           IN THE REAR
C0610X 5      MAXIMUM NUMBER OF ROUNDS PER WEAPON
R0577X 5      EXTERNAL RATE OF SUPPLY OF ROUNDS
R0605X 5      MAXIMUM FLOW RATE OF ROUNDS BETWEEN THE REAR AND THE FRONT PER R5R
V0551X 5      MAXIMUM NUMBER IN TRANSIT IN THE REAR
TITLE1        LONG RANGE WEAPON SYSTEM
TITLE2        SYSTEM 1 %L1 AND M1<
V0     25     NUMBER OF WEAPONS %L1<
R0579X 1      RATE OF EXTERNAL SUPPLY OF WEAPONS
R0301X 1      MAXIMUM FIRE PER WEAPON
F0301X 1      FRACTION OF WEAPONS ALLOCATED AGAINST FRONTAL TARGETS
F0302X 1 1    FRACTION OF FRONT WEAPONS   ALLOCATED AGAINST FRONT 1
F0302X 1 2                                          AGAINST FRONT 2
F0302X 1 3                                          AGAINST FRONT 3
F0303X 1 1    FRACTION OF FRONT 1 WEAPONS ALLOCATED AGAINST GROUND FORCES
F0303X 1 2             OF FRONT 2
F0303X 1 3             OF FRONT 3
F0312X 1 1    FRACTION OF FRONT 1 WEAPONS ALLOCATED AGAINST SUPPLY PACKETS
F0312X 1 2             OF FRONT 2
F0312X 1 3             OF FRONT 3
F0310X 1 1    FRACTION OF FRONT 1 WEAPONS ALLOCATED AGAINST S-R WEAPON SYSTEM 1
F0310X 1 4                                                    S-R WEAPON SYSTEM 2
F0310X 1 7                                                    S-R WEAPON SYSTEM 3
F0310X 110                                                    S-R WEAPON SYSTEM 4
F0310X 113                                                    S-R WEAPON SYSTEM 5
F0310X 1 2             OF FRONT 2 WEAPONS ALLOCATED AGAINST S-R WEAPON SYSTEM 1
F0310X 1 5                                                    S-R WEAPON SYSTEM 2
F0310X 1 8                                                    S-R WEAPON SYSTEM 3
F0310X 111                                                    S-R WEAPON SYSTEM 4
F0310X 114                                                    S-R WEAPON SYSTEM 5
F0310X 1 3             OFFFRONT 3 WEAPONS ALLOCATED AGAINST S-R WEAPON SYSTEM 1
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F0310X 1 6                                                   S-R WEAPON SYSTEM 2
F0310X 1 9                                                   S-R WEAPON SYSTEM 3
F0310X 112                                                   S-R WEAPON SYSTEM 4
F0310X 115                                                   S-R WEAPON SYSTEM 5
C0231X 1     FRACTION OF FRONTAL FORCES WITHIN WEAPON-S RANGE
C0232X 1     FRACTION OF FRONTAL SUPPLIES WITHIN WEAPON-S RANGE
C0236X 1 1   FRACTION OF FRONTAL S-R WEAPON SYSTEM 1 WITHIN WEAPONS RANGE
C0236X 1 2                       S-R WEAPON SYSTEM 2
C0236X 1 3                       S-R WEAPON SYSTEM 3
C0236X 1 4                       S-R WEAPON SYSTEM 4
C0236X 1 5                       S-R WEAPON SYSTEM 5
P0301X 1     WEAPON-S PK ON FRONTAL FORCES
P0302X 1                 ON FRONTAL SUPPLIES
P0308X 1 1               ON FRONTAL S-R WEAPON SYSTEM 1
P0308X 1 2                          S-R WEAPON SYSTEM 2
P0308X 1 3                          S-R WEAPON SYSTEM 3
P0308X 1 4                          S-R WEAPON SYSTEM 4
P0308X 1 5                          S-R WEAPON SYSTEM 5
F0301X 1-1   FRACTION OF WEAPONS ALLOCATED AGAINST REAR TARGETS
F0304X 1     FRACTION OF REAR WEAPONS   ALLOCATED AGAINST GROUND FORCES
F0305X 1                                       AGAINST SUPPLIES
F0311X 1 1                                     AGAINST S-R WEAPON SYSTEM 1
F0311X 1 2                                     AGAINST S-R WEAPON SYSTEM 2
F0311X 1 3                                     AGAINST S-R WEAPON SYSTEM 3
F0311X 1 4                                     AGAINST S-R WEAPON SYSTEM 4
F0311X 1 5                                     AGAINST S-R WEAPON SYSTEM 5
F0306X 1 1                                     AGAINST L-R WEAPON SYSTEM 1
F0306X 1 2                                     AGAINST L-R WEAPON SYSTEM 2
F0307X 1                                       AGAINST STORAGE SITES
F0308X 1 1                                     AGAINST FORWARD BASES
F0308X 1 2                                     AGAINST LONG RANGE BASES
C0233X 1     FRACTION OF REAR FORCES WITHIN WEAPON-S   RANGE
C0234X 1                 REAR SUPPLIES
C0237X 1 1               REAR S-R WEAPON SYSTEM 1
C0237X 1 2               REAR S-R WEAPON SYSTEM 2
C0237X 1 3               REAR S-R WEAPON SYSTEM 3
C0237X 1 4               REAR S-R WEAPON SYSTEM 4
C0237X 1 5               REAR S-R WEAPON SYSTEM 5
C0235X 1 1               L-R WEAPON SYSTEM 1
C0235X 1 2               L-R WEAPON SYSTEM 2
P0303X 1     WEAPON-S PK ON REAR GROUND FORCES
P0304X 1                    REAR SUPPLIES
P0309X 1 1                  REAR S-R WEAPON SYSTEM 1
P0309X 1 2                  REAR S-R WEAPON SYSTEM 2
P0309X 1 3                  REAR S-R WEAPON SYSTEM 3
P0309X 1 4                  REAR S-R WEAPON SYSTEM 4
P0309X 1 5                  REAR S-R WEAPON SYSTEM 5
P0305X 1 1                  L-R WEAPON SYSTEM 1
P0305X 1 2                  L-R WEAPON SYSTEM 2
P0306X 1                    STORAGE SITES
P0307X 1 1                  FORWARD BASES
P0307X 1 2                  LONG RANGE BASES
SPACE
V0     51    NUMBER OF ROUNDS XM1<
R0578X 1     RATE OF EXTERNAL SUPPLY OF ROUNDS
V0541X 1     NUMBER OF ROUNDS ASSOCIATED WITH EACH WEAPON
V0545X 1     MAXIMUM NUMBER IN TRANSIT IN THE REAR
TITLE1       LONG RANGE WEAPON SYSTEM
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TITLE2        SYSTEM 2 %L2 AND M2<
VO     26     NUMBER OF WEAPONS %L2<
R0579X 2      RATE OF EXTERNAL SUPPLY OF WEAPONS
R0301X 2      MAXIMUM FIRE PER WEAPON
F0301X 2      FRACTION OF WEAPONS ALLOCATED AGAINST FRONTAL TARGETS
F0302X 2 1    FRACTION OF FRONT WEAPONS   ALLOCATED AGAINST FRONT 1
F0302X 2 2                                          AGAINST FRONT 2
F0302X 2 3                                          AGAINST FRONT 3
F0303X 2 1    FRACTION OF FRONT 1 WEAPONS ALLOCATED AGAINST GROUND FORCES
F0303X 2 2                        FRONT 2
F0303X 2 3                        FRONT 3
F0312X 2 1    FRACTION OF FRONT 1 WEAPONS ALLOCATED AGAINST SUPPLY PACKETS
F0312X 2 2             OF FRONT 2
F0312X 2 3             OF FRONT 3
F0310X 2 1    FRACTION OF FRONT 1 WEAPONS ALLOCATED AGAINST S-R WEAPON SYSTEM 1
F0310X 2 4                                                  S-R WEAPON SYSTEM 2
F0310X 2 7                                                  S-R WEAPON SYSTEM 3
F0310X 210                                                  S-R WEAPON SYSTEM 4
F0310X 213                                                  S-R WEAPON SYSTEM 5
F0310X 2 2             OF FRONT 2 WEAPONS ALLOCATED AGAINST S-R WEAPON SYSTEM 1
F0310X 2 5                                                  S-R WEAPON SYSTEM 2
F0310X 2 8                                                  S-R WEAPON SYSTEM 3
F0310X 211                                                  S-R WEAPON SYSTEM 4
F0310X 214                                                  S-R WEAPON SYSTEM 5
F0310X 2 3             OF FRONT 3 WEAPONS ALLOCATED AGAINST S-R WEAPON SYSTEM 1
F0310X 2 6                                                  S-R WEAPON SYSTEM 2
F0310X 2 9                                                  S-R WEAPON SYSTEM 3
F0310X 212                                                  S-R WEAPON SYSTEM 4
F0310X 215                                                  S-R WEAPON SYSTEM 5
C0231X 2      FRACTION OF FRONTAL FORCES WITHIN WEAPON-S RANGE
C0232X 2      FRACTION OF FRONTAL SUPPLIES WITHIN WEAPON-S RANGE
C0236X 2 1    FRACTION OF FRONTAL S-R WEAPON SYSTEM 1 WITHIN WEAPONS RANGE
C0236X 2 2                        S-R WEAPON SYSTEM 2
C0236X 2 3                        S-R WEAPON SYSTEM 3
C0236X 2 4                        S-R WEAPON SYSTEM 4
C0236X 2 5                        S-R WEAPON SYSTEM 5
P0301X 2      WEAPON-S PK ON FRONTAL FORCES
P0302X 2                  ON FRONTAL SUPPLIES
P0308X 2 1                ON FRONTAL S-R WEAPON SYSTEM 1
P0308X 2 2                           S-R WEAPON SYSTEM 2
P0308X 2 3                           S-R WEAPON SYSTEM 3
P0308X 2 4                           S-R WEAPON SYSTEM 4
P0308X 2 5                           S-R WEAPON SYSTEM 5
F0301X 2-1    FRACTION OF WEAPONS ALLOCATED AGAINST REAR TARGETS
F0304X 2      FRACTION OF REAR WEAPONS   ALLOCATED AGAINST GROUND FORCES
F0305X 2                                         AGAINST SUPPLIES
F0311X 2 1                                       AGAINST S-R WEAPON SYSTEM 1
F0311X 2 2                                       AGAINST S-R WEAPON SYSTEM 2
F0311X 2 3                                       AGAINST S-R WEAPON SYSTEM 3
F0311X 2 4                                       AGAINST S-R WEAPON SYSTEM 4
F0311X 2 5                                       AGAINST S-R WEAPON SYSTEM 5
F0306X 2 1                                       AGAINST L-R WEAPON SYSTEM 1
F0306X 2 2                                       AGAINST L-R WEAPON SYSTEM 2
F0307X 2                                         AGAINST STORAGE SITES
F0308X 2 1                                       AGAINST FORWARD BASES
F0308X 2 2                                       AGAINST LONG RANGE BASES
C0233X 2      FRACTION OF REAR FORCES WITHIN WEAPON-S   RANGE
C0234X 2                  REAR SUPPLIES
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C0237X 2 1               REAR S-R WEAPON SYSTEM 1
C0237X 2 2               REAR S-R WEAPON SYSTEM 2
C0237X 2 3               REAR S-R WEAPON SYSTEM 3
C0237X 2 4               REAR S-R WEAPON SYSTEM 4
C0237X 2 5               REAR S-R WEAPON SYSTEM 5
C0235X 2 1               L-R WEAPON SYSTEM 1
C0235X 2 2               L-R WEAPON SYSTEM 2
P0303X 2     WEAPON-S PK ON REAR GROUND FORCES
P0304X 2                 ON REAR SUPPLIES
P0309X 2 1                  REAR S-R WEAPON SYSTEM 1
P0309X 2 2                  REAR S-R WEAPON SYSTEM 2
P0309X 2 3                  REAR S-R WEAPON SYSTEM 3
P0309X 2 4                  REAR S-R WEAPON SYSTEM 4
P0309X 2 5                  REAR S-R WEAPON SYSTEM 5
P0305X 2 1                  L-R WEAPON SYSTEM 1
P0305X 2 2                  L-R WEAPON SYSTEM 2
P0306X 2                 STORAGE SITES
P0307X 2 1               FORWARD BASES
P0307X 2 2               LONG RANGE BASES
SPACE
V0     52    NUMBER OF ROUNDS %M2<
R0578X 2     RATE OF EXTERNAL SUPPLY OF ROUNDS
V0541X 2     NUMBER OF ROUNDS ASSOCIATED WITH EACH WEAPON
V0545X 2     MAXIMUM NUMBER IN TRANSIT IN THE REAR
TITLE1       AIRCRAFT
TITLE2       INTERCEPTERS %A1<
V0     58    NUMBER OF INTERCEPTERS
R0571X 1     EXTERNAL SUPPLY RATE OF INTERCEPTERS
F0309X 1 1   FRACTION ASSIGNED TO FORWARD BASES
F0309X 1 2                     TO LONG RANGE BASES
R0001X 1     MAXIMUM FRACTIONAL LAUNCH RATE
F0001X 1-1   FRACTION ASSIGNED TO AN AIR-TO-AIR %A2A< MISSION
F0511X       AMOUNT OF CONVENTIONAL MUNITIONS USED PER AA MISSION
P0001X 1 1   PROBABILITY OF DETECTING IN THE AIR BATTLE EACH ENEMY A1A
P0001X 1 2                                                          A2A
P0001X 1 3                                                          A3A
P0003X 1 1                                                          A1G
P0003X 1 2                                                          A2G
P0003X 1 3                                                          A3G
P0002X 1 1   PROBABILITY OF KILLING IN THE AIR BATTLE EACH ENEMY A1A
P0002X 1 2                                                        A2A
P0002X 1 3                                                        A3A
P0004X 1 1                                                        A1G
P0004X 1 2                                                        A2G
P0004X 1 3                                                        A3G
IPACE
'0001X 1     FRACTION ASSIGNED TO AN AIR-TO-GROUND %A1G< MISSION
 0512X       AMOUNT OF CONVENTIONAL MUNITIONS EXPENDED PER A1G MISSION
 0101X 1     FRACTION OF AIR-TO-GROUND SENT TO THE FRONTS
 0201X 1 1   FRACTION OF AIR-TO-GROUND IN FRONT 1 SENT AGAINST GROUND FORCES
 0201X 1 2                             IN FRONT 2
 0201X 1 3                             IN FRONT 3
 0202X 1 1                             IN FRONT 1 SENT AGAINST SUPPLIES
 )202X 1 2                             IN FRONT 2
 )202X 1 3                             IN FRONT 3
 )203X 1 1                             IN FRONT 1 SENT AGAINST S-R WEAPON SYS 1
 )203X 1 4                                                     S-R WEAPON SYS 2
 '203X 1 7                                                     S-R WEAPON SYS 3
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F0203X 110                                                   S-R WEAPON SYS 4
F0203X 113                                                   S-R WEAPON SYS 5
F0203X 1 2                           IN FRONT 2 SENT AGAINST S-R WEAPON SYS 1
F0203X 1 5                                                   S-R WEAPON SYS 2
F0203X 1 8                                                   S-R WEAPON SYS 3
F0203X 111                                                   S-R WEAPON SYS 4
F0203X 114                                                   S-R WEAPON SYS 5
F0203X 1 3                           IN FRONT 3 SENT AGAINST S-R WEAPON SYS 1
F0203X 1 6                                                   S-R WEAPON SYS 2
F0203X 1 9                                                   S-R WEAPON SYS 3
F0203X 112                                                   S-R WEAPON SYS 4
F0203X 115                                                   S-R WEAPON SYS 5
C0211X 1    FRACTION OF FRONTAL FORCES WITHIN OPERATIONAL RANGE
C0212X 1    FRACTION OF FRONTAL SUPPLIES WITHIN OPERATIONAL RANGE
C0216X 1 1  FRACTION OF FRONTAL S-R WEAPON SYSTEM 1 IN OPERATIONAL RANGE
C0216X 1 2                      S-R WEAPON SYSTEM 2
C0216X 1 3                      S-R WEAPON SYSTEM 3
C0216X 1 4                      S-R WEAPON SYSTEM 4
C0216X 1 5                      S-R WEAPON SYSTEM 5
P0101X 1 2  PROBABILITY OF KILLING FRONTAL GROUND FORCES
P0102X 1 2                         FRONTAL SUPPLY PACKETS
P0328X 1 1 2                       FRONTAL S-R WEAPON SYSTEM 1
P0328X 1 2 2                               S-R WEAPON SYSTEM 2
P0328X 1 3 2                               S-R WEAPON SYSTEM 3
P0328X 1 4 2                               S-R WEAPON SYSTEM 4
P0328X 1 5 2                               S-R WEAPON SYSTEM 5
F0101X 1-1  FRACTION OF AIR-TO-GROUND SENT TO THE REAR
F0104X 1    FRACTION OF AIR-TO-GROUND IN THE REAR SENT AGAINST GROUND FORCES
F0105X 1                                              AGAINST SUPPLIES
F0111X 1 1                                            AGAINST S-R WEAPON SYS 1
F0111X 1 2                                            AGAINST S-R WEAPON SYS 2
F0111X 1 3                                            AGAINST S-R WEAPON SYS 3
F0111X 1 4                                            AGAINST S-R WEAPON SYS 4
F0111X 1 5                                            AGAINST S-R WEAPON SYS 5
F0107X 1 1                                            AGAINST L-R WEAPON SYS 1
F0107X 1 2                                            AGAINST L-R WEAPON SYS 2
F0106X 1                                              AGAINST STORAGE SITES
F0108X 1 1                                            AGAINST FORWARD BASES
F0108X 1 2                                            AGAINST LONG RANGE BASES
C0213X 1    FRACTION OF REAR GROUND FORCES IN OPERATIONAL RANGE
C0214X 1             OF REAR SUPPLY PACKETS
C0217X 1 1           OF S-R WEAPON SYSTEM 1
C0217X 1 2           OF S-R WEAPON SYSTEM 2
C0217X 1 3           OF S-R WEAPON SYSTEM 3
C0217X 1 4           OF S-R WEAPON SYSTEM 4
C0217X 1 5           OF S-R WEAPON SYSTEM 5
C0215X 1 1           OF L-R WEAPON SYSTEM 1
C0215X 1 2           OF L-R WEAPON SYSTEM 2
P0323X 1 2  PROBABILITY OF KILLING REAR GROUND FORCES
P0324X 1 2                         REAR SUPPLIES
P0329X 1 1 2                               REAR S-R WEAPON SYSTEM 1
P0329X 1 2 2                               REAR S-R WEAPON SYSTEM 2
P0329X 1 3 2                               REAR S-R WEAPON SYSTEM 3
P0329X 1 4 2                               REAR S-R WEAPON SYSTEM 4
P0329X 1 5 2                               REAR S-R WEAPON SYSTEM 5
P0326X 1 1 2                       L-R WEAPON SYSTEM 1
P0326X 1 2 2                       L-R WEAPON SYSTEM 2
P0325X 1 2                         STORAGE SITES
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P0327X 1 1 2                              AIRCRAFT ON FORWARD BASES
P0327X 1 2 2                              AIRCRAFT ON LONG RANGE BASES
C0307X 1 2   FACTOR FOR BASE DAMAGE ON FORWARD BASES
C0307X 2 2                              ON LONG RANGE BASES
TITLE1       AIRCRAFT
TITLE2       FIGHTER BOMBERS  %A2<
V0     59    NUMBER OF F-B
R0571X 2     EXTERNAL SUPPLY RATE OF F-B
F0309X 2 1   FRACTION ASSIGNED TO FORWARD BASES
F0309X 2 2                        TO LONG RANGE BASES
R0001X 2     MAXIMUM FRACTIONAL LAUNCH RATE
F0001X 2-1   FRACTION ASSIGNED TO AN AIR-TO-AIR %A2A< MISSION
E0511X       AMOUNT OF CONVENTIONAL MUNITIONS USED PER AA MISSION
P0001X 2 1   PROBABILITY OF DETECTING IN THE AIR BATTLE EACH ENEMY A1A
P0001X 2 2                                                         A2A
P0001X 2 3                                                         A3A
P0003X 2 1                                                         A1G
P0003X 2 2                                                         A2G
P0003X 2 3                                                         A3G
P0002X 2 1   PROBABILITY OF KILLING IN THE AIR BATTLE EACH ENEMY A1A
P0002X 2 2                                                       A2A
P0002X 2 3                                                       A3A
P0004X 2 1                                                       A1G
P0004X 2 2                                                       A2G
P0004X 2 3                                                       A3G
SPACE
F0001X 2     FRACTION ASSIGNED TO AN AIR-TO-GROUND %A2G< MISSION
E0513X 1     AMOUNT OF NUCLEAR MUNITIONS EXPENDED PER A2G NUCLEAR MISSION
E0513X 2     AMOUNT OF CONVENTIONAL MUNITION EXPENDED PER A2G CONV. MISSION
F0101X 2     FRACTION OF AIR-TO-GROUND SENT TO THE FRONTS
F0201X 2 1   FRACTION OF AIR-TO-GROUND IN FRONT 1 SENT AGAINST GROUND FORCES
F0201X 2 2                             IN FRONT 2
F0201X 2 3                             IN FRONT 3
F0202X 2 1                             IN FRONT 1 SENT AGAINST SUPPLIES
F0202X 2 2                             IN FRONT 2
F0202X 2 3                             IN FRONT 3
F0203X 2 1                             IN FRONT 1 SENT AGAINST S-R WEAPON SYS 1
F0203X 2 4                                                     S-R WEAPON SYS 2
F0203X 2 7                                                     S-R WEAPON SYS 3
F0203X 210                                                     S-R WEAPON SYS 4
F0203X 213                                                     S-R WEAPON SYS 5
F0203X 2 2                             IN FRONT 2 SENT AGAINST S-R WEAPON SYS 1
F0203X 2 5                                                     S-R WEAPON SYS 2
F0203X 2 8                                                     S-R WEAPON SYS 3
F0203X 211                                                     S-R WEAPON SYS 4
F0203X 214                                                     S-R WEAPON SYS 5
F0203X 2 3                             IN FRONT 3 SENT AGAINST S-R WEAPON SYS 1
F0203X 2 6                                                     S-R WEAPON SYS 2
F0203X 2 9                                                     S-R WEAPON SYS 3
F0203X 212                                                     S-R WEAPON SYS 4
F0203X 215                                                     S-R WEAPON SYS 5
C0211X 2     FRACTION OF FRONTAL FORCES IN OPERATIONAL RANGE
C0212X 2     FRACTION OF FRONTAL SUPPLIES IN OPERATIONAL RANGE
C0216X 2 1   FRACTION OF FRONTAL S-R WEAPON SYSTEM 1 IN OPERATIONAL RANGE
C0216X 2 2                       S-R WEAPON SYSTEM 2
C0216X 2 3                       S-R WEAPON SYSTEM 3
C0216X 2 4                       S-R WEAPON SYSTEM 4
C0216X 2 5                       S-R WEAPON SYSTEM 5
```

```
P0101X 2 1    PROBABILITY OF NUC KILL OF FRONTAL GROUND FORCES
P0101X 2 2                OF CONV KILL
P0102X 2 1                OF NUC KILL OF FRONTAL SUPPLIES
P0102X 2 2                OF CONV KILL
P0328X 2 1 1              OF NUC KILL OF FRONTAL S-R WEAPON SYSTEM 1
P0328X 2 1 2              OF CONV KILL
P0328X 2 2 1              OF NUC KILL OF FRONTAL S-R WEAPON SYSTEM 2
P0328X 2 2 2              OF CONV KILL
P0328X 2 3 1              OF NUC KILL OF FRONTAL S-R WEAPON SYSTEM 3
P0328X 2 3 2              OF CONV KILL
P0328X 2 4 1              OF NUC KILL OF FRONTAL S-R WEAPON SYSTEM 4
P0328X 2 4 2              OF CONV KILL
P0328X 2 5 1              OF NUC KILL OF FRONTAL S-R WEAPON SYSTEM 5
P0328X 2 5 2              OF CONV KILL
F0101X 2-1    FRACTION OF AIR-TO-GROUND SENT TO THE REAR
F0104X 2      FRACTION OF AIR-TO-GROUND IN THE REAR SENT AGAINST GROUND FORCES
F0105X 2                                                 AGAINST SUPPLIES
F0111X 2 1                                               AGAINST S-R WEAPON SYS 1
F0111X 2 2                                               AGAINST S-R WEAPON SYS 2
F0111X 2 3                                               AGAINST S-R WEAPON SYS 3
F0111X 2 4                                               AGAINST S-R WEAPON SYS 4
F0111X 2 5                                               AGAINST S-R WEAPON SYS 5
F0107X 2 1                                               AGAINST L-R WEAPON SYS 1
F0107X 2 2                                               AGAINST L-R WEAPON SYS 2
F0106X 2                                                 AGAINST STORAGE SITES
F0108X 2 1                                               AGAINST FORWARD BASES
F0108X 2 2                                               AGAINST LONG RANGE BASES
C0213X 2      FRACTION OF REAR GROUND FORCES IN OPERATIONAL RANGE
C0214X 2               OF REAR SUPPLIES
C0217X 2 1             OF S-R WEAPON SYSTEM 1
C0217X 2 2             OF S-R WEAPON SYSTEM 2
C0217X 2 3             OF S-R WEAPON SYSTEM 3
C0217X 2 4             OF S-R WEAPON SYSTEM 4
C0217X 2 5             OF S-R WEAPON SYSTEM 5
C0215X 2 1             OF L-R WEAPON SYSTEM 1
C0215X 2 2             OF L-R WEAPON SYSTEM 2
P0323X 2 1    PROBABILITY OF NUC KILL ON REAR GROUND FLORCES
P0323X 2 2                OF CONV KILL
P0324X 2 1                OF NUC KILL ON REAR SUPPLIES
P0324X 2 2                OF CONV KILL
P0329X 2 1 1              OF NUC KILL ON REAR S-R WEAPON SYSTEM 1
P0329X 2 1 2              OF CONV KILL
P0329X 2 2 1              OF NUC KILL ON REAR S-R WEAPON SYSTEM 2
P0329X 2 2 2              OF CONV KILL
P0329X 2 3 1              OF NUC KILL ON REAR S-R WEAPON SYSTEM 3
P0329X 2 3 2              OF CONV KILL
P0329X 2 4 1              OF NUC KILL ON REAR S-R WEAPON SYSTEM 4
P0329X 2 4 2              OF CONV KILL
P0329X 2 5 1              OF NUC KILL ON REAR S-R WEAPON SYSTEM 5
P0329X 2 5 2              OF CONV KILL
P0326X 2 1 1              OF NUC KILL ON L-R WEAPON SYSTEM 1
P0326X 2 1 2              OF CONV KILL
P0326X 2 2 1              OF NUC KILL ON L-R WEAPON SYSTEM 2
P0326X 2 2 2              OF CONV KILL
P0325X 2 1                OF NUC KILL ON STORAGE SITES
P0325X 2 2                OF CONV KILL
P0327X 2 1 1              OF NUC KILL ON AIRCRAFT ON FORWARD BASES
P0327X 2 1 2              OF CONV KILL
```

```
P0327X 2 2 1                OF NUC KILL ON AIRCRAFT ON LONG RANGE BASES
P0327X 2 2 2                OF CONV KILL
C0307X 1 1   FACTOR FOR NUC DAMAGE TO FORWARD BASES
C0307X 1 2          FOR CONV DAMAGE
C0307X 2 1          FOR NUC DAMAGE TO LONG RANGE BASES
C0307X 2 2          FOR CONV DAMAGE
TITLE1       AIRCRAFT
TITLE2       LONG RANGE AIRCRAFT %A3<
V0     60    NUMBER OF LRA
R0571X 3     EXTERNAL SUPPLY RATE OF LRA
F0309X 3 1   FRACTION ASSIGNED TO FORWARD BASES
F0309X 3 2                TO LONG RANGE BASES
R0001X 3     MAXIMUM FRACTIONAL LAUNCH RATE
F0001X 3-1   FRACTION ASSIGNED TO AN AIR-TO-AIR %A3A< MISSION
F0511X       AMOUNT OF CONVENTIONAL MUNITIONS EXPENDED PER AA MISSION
P0001X 3 1   PROBABILITY OF DETECTING IN THE AIR BATTLE EACH ENEMY A1A
P0001X 3 2                                                          A2A
P0001X 3 3                                                          A3A
P0003X 3 1                                                          A1G
P0003X 3 2                                                          A2G
P0003X 3 3                                                          A3G
P0002X 3 1   PROBABILITY OF KILLING IN THE AIR BATTLE EACH ENEMY A1A
P0002X 3 2                                                        A2A
P0002X 3 3                                                        A3A
P0004X 3 1                                                        A1G
P0004X 3 2                                                        A2G
P0004X 3 3                                                        A3G
SPACE
F0001X 3     FRACTION ASSIGNED TO AN AIR-TO-GROUND %A3G< MISSION
F0514X 1     AMOUNT OF NUCLEAR MUNITIONS EXPENDED PER A3G NUC MISSION
E0514X 2     AMOUNT OF CONVENTIONAL MUNITIONS EXPENDED PER A3G CONV MISSION
F0101X 3     FRACTION OF AIR-TO-GROUND SENT TO THE FRONTS
F0201X 3 1   FRACTION OF AIR-TO-GROUND IN FRONT 1 SENT AGAINST GROUND FORCES
F0201X 3 2                             IN FRONT 2
F0201X 3 3                             IN FRONT 3
F0202X 3 1                             IN FRONT 1 SENT AGAINST SUPPLIES
F0202X 3 2                             IN FRONT 2
F0202X 3 3                             IN FRONT 3
F0203X 3 1                             IN FRONT 1 SENT AGAINST S-R WEAPON SYS 1
F0203X 3 4                                                     S-R WEAPON SYS 2
F0203X 3 7                                                     S-R WEAPON SYS 3
F0203X 310                                                     S-R WEAPON SYS 4
F0203X 313                                                     S-R WEAPON SYS 5
F0203X 3 2                             IN FRONT 2 SENT AGAINST S-R WEAPON SYS 1
F0203X 3 5                                                     S-R WEAPON SYS 2
F0203X 3 8                                                     S-R WEAPON SYS 3
F0203X 311                                                     S-R WEAPON SYS 4
F0203X 314                                                     S-R WEAPON SYS 5
F0203X 3 3                             IN FRONT 3 SENT AGAINST S-R WEAPON SYS 1
F0203X 3 6                                                     S-R WEAPON SYS 2
F0203X 3 9                                                     S-R WEAPON SYS 3
F0203X 312                                                     S-R WEAPON SYS 4
F0203X 315                                                     S-R WEAPON SYS 5
C0211X 3     FRACTION OF FRONTAL FORCES IN OPERATIONAL RANGE
C0212X 3     FRACTION OF FRONTAL SUPPLIES IN OPERATIONAL RANGE
C0216X 3 1   FRACTION OF FRONTAL S-R WEAPON SYSTEM 1 IN OPERATIONAL RANGE
C0216X 3 2                       S-R WEAPON SYSTEM 2
C0216X 3 3                       S-R WEAPON SYSTEM 3
```

```
C0216X 3 4                      S-R WEAPON SYSTEM 4
C0216X 3 5                      S-R WEAPON SYSTEM 5
P0101X 3 1  PROBABILITY OF NUC KILL ON FRONTAL GROUND FORCES
P0101X 3 2              OF CONV KILL
P0102X 3 1              OF NUC KILL ON FRONTAL SUPPLIES
P0102X 3 2              OF CONV KILL
P0328X 3 1 1            OF NUC KILL OF FRONTAL S-R WEAPON SYSTEM 1
P0328X 3 1 2            OF CONV KILL
P0328X 3 2 1            OF NUC KILL OF FRONTAL S-R WEAPON SYSTEM 2
P0328X 3 2 2            OF CONV KILL
P0328X 3 3 1            OF NUC KILL OF FRONTAL S-R WEAPON SYSTEM 3
P0328X 3 3 2            OF CONV KILL
P0328X 3 4 1            OF NUC KILL OF FRONTAL S-R WEAPON SYSTEM 4
P0328X 3 4 2            OF CONV KILL
P0328X 3 5 1            OF NUC KILL OF FRONTAL S-R WEAPON SYSTEM 5
P0328X 3 5 2            OF CONV KILL
F0101X 3-1  FRACTION OF AIR-TO-GROUND SENT TO THE REAR
F0104X 3    FRACTION OF AIR-TO-GROUND IN THE REAR SENT AGAINST GROUND FORCES
F0105X 3                                               AGAINST SUPPLIES
F0111X 3 1                                             AGAINST S-R WEAPON SYS 1
F0111X 3 2                                             AGAINST S-R WEAPON SYS 2
F0111X 3 3                                             AGAINST S-R WEAPON SYS 3
F0111X 3 4                                             AGAINST S-R WEAPON SYS 4
F0111X 3 5                                             AGAINST S-R WEAPON SYS 5
F0107X 3 1                                             AGAINST L-R WEAPON SYS 1
F0107X 3 2                                             AGAINST L-R WEAPON SYS 2
F0106X 3                                               AGAINST STORAGE SITES
F0108X 3 1                                             AGAINST FORWARD BASES
F0108X 3 2                                             AGAINST LONG RANGE BASES
C0213X 3    FRACTION OF REAR GROUND FORCES IN OPERATIONAL RANGE
C0214X 3             OF REAR SUPPLIES
C0217X 3 1           OF S-R WEAPON SYSTEM 1
C0217X 3 2           OF S-R WEAPON SYSTEM 2
C0217X 3 3           OF S-R WEAPON SYSTEM 3
C0217X 3 4           OF S-R WEAPON SYSTEM 4
C0217X 3 5           OF S-R WEAPON SYSTEM 5
C0215X 3 1           OF L-R WEAPON SYSTEM 1
C0215X 3 2           OF L-R WEAPON SYSTEM 2
P0323X 3 1  PROBABILITY OF NUC KILL ON REAR GROUND FORCES
P0323X 3 2              OF CONV KILL
P0324X 3 1              OF NUC KILL ON REAR SUPPLIES
P0324X 3 2              OF CONV KILL
P0329X 3 1 1            OF NUC KILL ON REAR S-R WEAPON SYSTEM 1
P0329X 3 1 2            OF CONV KILL
P0329X 3 2 1            OF NUC KILL ON REAR S-R WEAPON SYSTEM 2
P0329X 3 3 1            OF NUC KILL ON REAR S-R WEAPON SYSTEM 3
P0329X 3 3 2            OF CONV KILL
P0329X 3 4 1            OF NUC KILL ON REAR S-R WEAPON SYSTEM 4
P0329X 3 4 2            OF CONV KILL
P0329X 3 5 1            OF NUC KILL ON REAR S-R WEAPON SYSTEM 5
P0329X 3 5 2            OF CONV KILL
P0326X 3 1 1            OF NUC KILL ON L-R WEAPON SYSTEM 1
P0326X 3 1 2            OF CONV KILL
P0326X 3 2 1            OF NUC KILL ON L-R WEAPON SYSTEM 2
P0326X 3 2 2            OF CONV KILL
P0325X 3 1              OF NUC KILL ON STORAGE SITES
P0325X 3 2              OF CONV KILL
P0327X 3 1 1            OF NUC KILL ON AIRCRAFT ON FORWARD BASES
```

```
P0327X 3 1 2             OF CONV KILL
P0327X 3 2 1             OF NUC KILL ON AIRCRAFT ON LONG RANGE BASES
P0327X 3 2 2             OF CONV KILL
C0307X 1 1  FACTOR FOR NUC DAMAGE TO FORWARD BASES
C0307X 1 2         FOR CONV DAMAGE
C0307X 2 1         FOR NUC DAMAGE TO LONG RANGE BASES
C0307X 2 2         FOR CONV DAMAGE
END
```

APPENDIX B

COMBAT II PROGRAM DESIGN LANGUAGE

```
* PROGRAM (COMBAT-II)
    * READ MODEL TYPE
    * IF (MODEL TYPE = AIR) THEN
        * INCLUDE (AIR INPUT)
    * ELSE IF (MODEL TYPE = ARTILLERY) THEN
        * INCLUDE (ARTILLERY INPUT)
    * ELSE
        * PRINT ERROR MESSAGE
        * STOP
* END
```

* PROGRAM FORMS (GENERATE INPUTS TO COMBAT-II)
  GENERATE NAMELIST DECK AND MAG TAPE INPUTS, ALSO,
  GENERATE TWO BLANK FORMS LISTINGS (WORKING SHEETS).

* INITIALIZE "FORMS" VARIABLES FOR THE "AIR" OR THE "ARTILLERY" MODELS

* DO UNTIL (AN "END OF RECORD" IS ENCOUNTERED)

    * READ A "COMBAT-II" VARIABLE, ITS TYPE DESIGNATOR AND ITS THREE
      SUBSCRIPT DESIGNATORS, IGNORING CARDS WITH BLANK VARIABLE FIELD.

    * CHECK THE VALIDITY OF EACH OF THE THREE SUBSCRIPT DESIGNATORS.

    * IF (A SUBSCRIPT DESIGNATOR IS NOT ALLOWED) THEN

        * PRINT AN ERROR MESSAGE

        * STOP PROGRAM EXECUTION

    * ELSE

        * FIND THE ALLOWED MAX VALUES FOR THE SET OF SUBSCRIPTS OF THE
          CURRENT "COMBAT-II" VARIABLE FROM ITS SUBSCRIPT DESIGNATORS

        * DO UNTIL (MAX VALUE OF EACH SUBSCRIPT IS REACHED)

            * GENERATE A SEQUENCE NUMBER AND A SET OF UP TO THREE
              SUBSCRIPTS FOR THE CURRENT "COMBAT-II" VARIABLE.

            * ENCODE THE CURRENT "COMBAT-II" VARIABLE, ITS TYPE
              DESIGNATOR AND THE GENERATED SET OF SUBSCRIPTS

            * WRITE AN ENCODED TYPE X VARIABLE, IN A NAMELIST FORMAT, ON
              TAPE9 FOR LATER GENERATION OF THE NAMELIST DECK

            * SAVE A TYPE X VARIABLE (ENCODED WITH ITS TYPE DESIGNATOR)
              IN AN ELEMENT OF THE ARRAY "VNAME" INDEXED BY THE CURRENT
              SEQUENCE NUMBER.

* SAVE THE CORRESPONDING SET OF GENERATED SUBSCRIPTS (ENCODED SEPARATELY) IN THE ARRAY "VCODE" ALSO INDEXED BY THE CURRENT SEQUENCE NUMBER.

* IF (SEVEN ENCODED VARIABLES (OR LESS WHEN NEAR END OF TYPE X OR NEAR END OF TYPE P INPUT STREAM) HAVE BEEN GENERATED) THEN

  * PRINT THE ENCODED TYPE X OR P VARIABLES AND THEIR SEQUENCE NUMBERS. IN A MAX OF SEVEN COLUMN DISPLAY FORMAT (1ST LISTING OF BLANK FORMS).

  * WRITE THE SAME VARIABLES AND SEQUENCE NUMBERS ON TAPE8 FOR LATER USE (UNFORMATTED).

* ELSE

* END DO

* END DO

* WRITE NUMBER OF GENERATED TYPE X AND TYPE P ENCODED VARIABLES ON TOP OF A NEW FILE (TAPE7).

* COPY TAPE8 ONTO TAPE7 FOR LATER DUMP ON A MAG TAPE.

THE FOLLOWING IS A LATE ADDITION TO "FORMS". IT READS THE INPUT VARIABLE DICTIONARY DECK, WHICH CONTAINS DESCRIPTIONS OF TYPE X VARIABLES, AND GENERATES THE 2ND BLANK FORMS LISTING AND MAG TAPE OUTPUT.

* DO UNTIL (AN "END" CARD OR AN "END OF RECORD" IS ENCOUNTERED)

  * READ A "COMBAT-II" VARIABLE (WITH TYPE DESIGNATOR), ITS THREE INDICES AND THE CORRESPONDING DESCRIPTION.

  * IF (A "SPACE", "TITLE1" OR "TITLE2" IS IN THE FIRST FIELD) THEN

    * PRINT PERTINENT COMMENTS, BLANKS OR TITLE

    * WRITE THE SAME INFORMATION ON TAPE7 (UNFORMATTED).

```
* ELSE

   * GENERATE THE SUBSCRIPT SET OF THE VARIABLE FROM THE THREE INDICES.

   * COMPARE THE VARIABLE AND THE ASSOCIATED SET OF SUBSCRIPTS AGAINST
     THE PREVIOUSLY SAVED VARIABLES (VNAME) AND SUBSCRIPTS (VCODE).

   * IF (A COMPLETE MATCH IS NOT FOUND) THEN

      * PRINT ERROR MESSAGE

   * ELSE

      * STORE THE SEQUENCE NUMBERS FOR THE BLUE AND RED VERSION OF THE
        VARIABLE

      * PRINT THE VARIABLE, ITS INDICES THE CORRESPONDING DESCRIPTION
        AND THE BLUE/RED SEQUENCE NUMBER IN A FOUR COLUMN DISPLAY
        FORMAT (2ND LISTING OF BLANK FORMS).

      * WRITE THE SAME INFORMATION ON TAPE7 (UNFORMATTED)

* END DO

END
```

```
* SEGMENT (AIR VERSION INPUT) (THE SAME LOGIC IS USED FOR THE ARTILLERY
  VERSION)

    * READ RFLG, OFLG, DFLG, TFLG, BFLG, START TIME, TITLE

    * IF (BFLG) THEN

        * READ STATE OF PREVIOUS GAME FROM ITS OUTPUT TAPE

        * SET RESTART TIME

    * ELSE

        * IF (RFLG) THEN

            * READ NEW BASE CASE FROM NAME LIST
              CARD DECK

            * WRITE A BASE CASE TAPE

        * ELSE

            * READ DICTIONARY TAPE

            * READ OLD BASE CASE TAPE

        * IF (OFLG)

            * PRODUCE CROSS REFERENCE LISTING WITH VALUES FILLED IN

        * IF (TFLG) THEN

            * PRINT INPUT TABLES (VARIABLE DESCRIPTION LISTING)

        * READ INTEGRATION CONTROL CARD (DEQ)

        * PROCESS TIME ZERO MODIFY CARDS IF ANY

        * INCLUDE (AIR MODEL)

* END
```

```
* SEGMENT (AIR MODEL)

    * IF (NOT A RESTARTED GAME) THEN

        * INITIALIZE STATE VECTORS

    * INITIALIZE INTEGRATION PARAMETERS

    * WRITE (INITIAL) STATE OF MODEL TO THE OUTPUT TAPE

    * DO (FOR EACH DATA POINT)

        * DO (UNTIL INTEGRATION TIME REACHES DATA POINT)

            * INCLUDE (INTEGRATOR)
              RESTRICT QUANTITIES TO NON-NEGATIVE

            * CALCULATE ALL THE COEFFICIENTS AND KINEMATICS DEPENDENT
              ON THE INTEGRATED VARIABLES

                * SOLVE FIRST EQUATION SET

                    * DETERMINE STATE OF BASES

                    * LAUNCH AIRCRAFT

                    * DETERMINE MISSION MIXES (AIRCRAFT AND WEAPON
                      TYPES)

                    * DETERMINE LOSSES DUE TO AIR-TO-AIR

                * SOLVE SECOND EQUATION SET (AIR DEFENSE)

                    * DETERMINE SUCCESS OF GROUND FORCES IN FRONT
                      VS AIRCRAFT

                    * DETERMINE SUCCESS OF SUPPLY IN FRONT VS AIRCRAFT

                    * DETERMINE SUCCESS OF GROUND FORCES IN REAR VS
                      AIRCRAFT

                    * DETERMINE SUCCESS OF SUPPLY IN REAR VS AIRCRAFT

                    * DETERMINE SUCCESS OF SITES VS AIRCRAFT

                    * DETERMINE SUCCESS OF LAUNCHERS VS AIRCRAFT

                    * DETERMINE SUCCESS OF BASES VS AIRCRAFT
```

* SOLVE THIRD EQUATION SET
    * DETERMINE EFFECTIVENESS OF MISSILES
        * MISSILES VS GROUND FORCES IN FRONT
        * MISSILES VS SUPPLY IN FRONT
        * MISSILES VS GROUND FORCES IN REAR
        * MISSILES VS SUPPLY IN REAR
        * MISSILES VS SITES
        * MISSILES VS LAUNCHERS
        * MISSILES VS BASES
    * DETERMINE EFFECTIVENESS OF AIRCRAFT
        * AIRCRAFT VS GROUND FORCES IN FRONT
        * AIRCRAFT VS SUPPLY IN FRONT
        * AIRCRAFT VS GROUND FORCES IN REAR
        * AIRCRAFT VS SUPPLY IN REAR
        * AIRCRAFT VS SITES
        * AIRCRAFT VS LAUNCHERS
        * AIRCRAFT VS BASES
* SOLVE FOURTH EQUATION SET
    * DETERMINE ATTRITION OF GROUND FORCES IN FRONT
    * DETERMINE EFFECTS OF ARTILLERY ROUNDS
        * CONVENTIONAL VS GROUND FORCES
        * NUCLEAR VS GROUND FORCES
        * CONVENTIONAL VS SUPPLY
        * NUCLEAR VS SUPPLY

* SOLVE FIFTH EQUATION SET
  DETERMINE ATTRITION CAUSES

    * LOSSES OF GROUND FORCES IN FRONT
    * AIRCRAFT LOSSES AND ASSOCIATED EXPENDITURES
    * LOSSES AND EXPENDITURE OF SUPPLY
    * LOSSES OF FORCES IN REAR
    * LOSSES OF SUPPLY IN REAR
    * LOSSES OF SITES
    * LOSSES OF LAUNCHERS
    * LOSSES OF MISSILES
    * LOSSES OF WEAPON SYSTEMS IN FRONT
    * LOSSES AND EXPENDITURE OF ROUNDS IN FRONT
    * LOSSES OF WEAPON SYSTEMS IN REAR
    * LOSSES OF ROUNDS IN REAR
    * CALCULATE RESUPPLY RATES

* SOLVE SIXTH EQUATION SET (KINEMATICS)

    * DETERMINE FRONTAL MOVEMENT RATE
    * DETERMINE RATE OF MOVEMENT OF AIRCRAFT, ACTUAL AND ACQUIRED
    * DETERMINE DEMAND FOR GROUND FORCES AND SUPPLY
    * DETERMINE RATE OF MOVEMENT OF GROUND FORCES AND SUPPLY FROM/TO REAR.
    * DETERMINE RATE OF MOVEMENT OF MISSILES AND LAUNCHERS FROM/TO THE REAR.
    * DETERMINE DEMAND AND FLOW OF CONVENTIONAL AND NUCLEAR ROUNDS FROM/TO THE REAR.
    * DETERMINE RATE OF MOVEMENT OF CONVENTIONAL AND NUCLEAR ROUNDS FROM/TO REAR.
    * DETERMINE RATE OF MUNITIONS MOVEMENT FROM THE SITES.

```
            * CHECK FOR USER MODIFICATIONS OF COEFFICIENTS OR
              DATA INTERVAL

        * END DO

        * WRITE COMPLETE MODEL STATE ON OUTPUT TAPE

    * END DO

* END
```

```
* SEGMENT (ARTILLERY MODEL)

    * IF (NOT A RESTARTED GAME) THEN

        * INITIALIZE STATE VECTORS

    * INITIALIZE INTEGRATION PARAMETERS

    * WRITE (INITIAL) STATE OF MODEL OUTPUT TAPE

    * DO (FOR EACH DATA POINT)

        * DO (UNTIL INTEGRATION TIME REACHES DATA POINT)

            * INCLUDE (INTEGRATOR)
              RESTRICT QUANTITIES TO NON-NEGATIVE

            * CALCULATE ALL THE COEFFICIENTS AND KINEMATICS DEPENDENT
              ON THE INTEGRATED VARIABLES

                * SOLVE FIRST EQUATION SET

                    * DETERMINE STATE OF BASES

                    * LAUNCH AIRCRAFT

                    * DETERMINE MISSION MIXES (AIRCRAFT AND WEAPON
                      TYPES)

                    * DETERMINE LOSSES DUE TO AIR-TO-AIR

                * SOLVE SECOND EQUATION SET (AIR DEFENSE)

                    * DETERMINE SUCCESS OF GROUND FORCES IN FRONT
                      VS AIRCRAFT

                    * DETERMINE SUCCESS OF SUPPLY IN FRONT VS AIRCRAFT

                    * DETERMINE SUCCESS OF GROUND FORCES IN REAR VS
                      AIRCRAFT

                    * DETERMINE SUCCESS OF SUPPLY IN REAR VS AIRCRAFT

                    * DETERMINE SUCCESS OF SITES VS AIRCRAFT

                    * DETERMINE SUCCESS OF LAUNCHERS VS AIRCRAFT

                    * DETERMINE SUCCESS OF BASES VS AIRCRAFT

                    * DETERMINE SUCCESS OF FRONTAL WEAPON SYSTEMS
                      VS AIRCRAFT
```

    * DETERMINE SUCCESS OF WEAPON SYSTEMS IN REAR VS AIRCRAFT

* SOLVE THIRD EQUATION SET

    * DETERMINE EFFECTIVENESS OF MISSILES

        * MISSILES VS GROUND FORCES IN FRONT
        * MISSILES VS SUPPLY IN FRONT
        * MISSILES VS WEAPON SYSTEMS IN FRONT
        * MISSILES VS GROUND FORCES IN REAR
        * MISSILES VS SUPPLY IN REAR
        * MISSILES VS WEAPON SYSTEMS IN REAR
        * MISSILES VS SITES
        * MISSILES VS LAUNCHERS
        * MISSILES VS BASES

    * DETERMINE EFFECTIVENESS OF AIRCRAFT

        * AIRCRAFT VS GROUND FORCES IN FRONT
        * AIRCRAFT VS SUPPLY IN FRONT
        * AIRCRAFT VS WEAPON SYSTEMS IN FRONT
        * AIRCRAFT VS GROUND FORCES IN REAR
        * AIRCRAFT VS SUPPLY IN REAR
        * AIRCRAFT VS WEAPON SYSTEMS IN REAR
        * AIRCRAFT VS SITES
        * AIRCRAFT VS LAUNCHERS
        * AIRCRAFT VS BASES

* SOLVE FOURTH EQUATION SET

    * DETERMINE ATTRITION OF GROUND FORCES IN FRONT

* DETERMINE WEAPON SYSTEMS EFFECTIVENESS
    * FRONTAL WEAPONS VS GROUND FORCES IN FRONT
    * FRONTAL WEAPONS VS SUPPLY IN FRONT
    * FRONTAL WEAPONS VS FRONTAL WEAPONS

* SOLVE FIFTH EQUATION SET
  DETERMINE ATTRITION CAUSES
  * LOSSES OF GROUND FORCES IN FRONT
  * AIRCRAFT LOSSES AND ASSOCIATED EXPENDITURES
  * LOSSES AND EXPENDITURE OF SUPPLY
  * LOSSES OF FORCES IN REAR
  * LOSSES OF SUPPLY IN REAR
  * LOSSES OF SITES
  * LOSSES OF LAUNCHERS
  * LOSSES OF MISSILES
  * LOSSES OF WEAPON SYSTEMS IN FRONT
  * LOSSES AND EXPENDITURE OF ROUNDS IN FRONT
  * LOSSES OF WEAPON SYSTEMS IN REAR
  * LOSSES OF ROUNDS IN REAR
  * CALCULATE RESUPPLY RATES

* SOLVE SIXTH EQUATION SET (KINEMATICS)
  * DETERMINE FRONTAL MOVEMENT RATE
  * DETERMINE RATE OF MOVEMENT OF AIRCRAFT, ACTUAL AND ACQUIRED
  * DETERMINE DEMAND FOR GROUND FORCES AND SUPPLY
  * DETERMINE RATE OF MOVEMENT OF GROUND FORCES AND SUPPLY FROM/TO REAR.
  * DETERMINE RATE OF MOVEMENT OF MISSILES AND LAUNCHERS FROM/TO THE REAR.

```
                    * DETERMINE DEMAND AND FLOW OF WEAPON SYSTEMS
                      AND ROUNDS FROM/TO THE REAR

                    * DETERMINE RATE OF MOVEMENT OF WEAPON SYSTEMS
                      AND ROUNDS IN REAR

                    * DETERMINE RATE OF MOVEMENT OF MUNITIONS FROM THE
                      SITES

                * CHECK FOR USER MODIFICATIONS OF COEFFICIENTS OR
                  DATA INTERVAL

            * END DO

            * WRITE COMPLETE MODEL STATE ON OUTPUT TAPE

        * END DO

    * END
```

```
*  SEGMENT (INTEGRATOR)

*  INTEGRATES A SYSTEM OF FIRST-ORDER ORDINARY DIFFERENTIAL EQUATIONS,
   USING THE ADAMS-MOULTON PREDICATOR-CORRECTOR METHOD

     *  CASE (PROGRAM PHASE)

          *  PHASE = RUNGE-KUTTA SETUP

               *  INITIALIZE INTEGRATION VALUE MATRICES

               *  SETUP FOR RUNGE-KUTTA INTEGRATIONS

               *  SET PROGRAM PHASE TO INTEGRATION

               *  SET INTEGRATION CONTROL TO 1

          *  PHASE = INTEGRATION

               *  CASE (INTEGRATION CONTROL)

                    *  CONTROL = 1

                         *  PERFORM STEP 1 OF RUNGE-KUTTA INTEGRATION

                         *  RESET INTEGRATION CONTROL TO 2

                    *  CONTROL = 2

                         *  STEP 2 OF RUNGE-KUTTA

                         *  RESET INTEGRATION CONTROL TO 3

                    *  CONTROL = 3

                         *  STEP 3 OF RUNGE-KUTTA

                         *  RESET INTEGRATION CONTROL TO 4
```

```
* CONTROL = 4

    * STEP 4 OF RUNGE-KUTTA

    * THIS INTEGRATION COMPLETED - MOVE SOLUTIONS UP

    * INCREMENT CURRENT TIME BY INTEGRATION TIME STEP

    * IF (END OF CURRENT INTERVAL REACHED) THEN

        * SET PROGRAM PHASE TO "END OF INTERVAL"

    * ELSE IF (WE HAVE FOUR VALID PREVIOUS SOLUTIONS) THEN

        * USE ADAMS-MOULTON PREDICTOR TO PREDICT NEXT SOLUTION

        * RESET INTEGRATION CONTROL TO 5

    * ELSE

        * RESET INTEGRATION CONTROL TO 1

* CONTROL = 5

    * APPLY ADAMS-MOULTON CORRECTOR TO PREDICTED SOLUTION

    * COMPUTE ERROR TERM

    * IF (ERROR TOO LARGE) THEN

        * HALVE STEP TIME

        * SETUP TO USE RUNGE-KUTTA AGAIN (WITH THE NEW TIME
          STEP) ONLY THE PREVIOUS RESULT IS USEFUL.

        * RESET INTEGRATION CONTROL TO 1
```

```
* ELSE IF (ERROR TERM VERY SMALL) THEN

    * DOUBLE TIME STEP

    * IF (NEW STEP GOES TOO FAR PAST END OF INTERVAL) THEN

        * MUST COMPUTE SOLUTION AT END OF CURRENT INTERVAL, USING
          RUNGE-KUTTA

        * SETUP FOR RUNGE-KUTTA AT END OF INTERVAL

        * SET INTEGRATION CONTROL TO 1

    * ELSE

        * WE HAVE 3 VALID PREVIOUS VALUES - SAVE THEM

        * SET INTEGRATION CONTROL TO 8

    * ELSE

        * RESET INTEGRATION CONTROL TO 6

* CONTROL = 6

    * ADVANCE SOLUTIONS

    * IF (AT END OF INTERVAL) THEN

        * SET PROGRAM PHASE TO 'END OF INTERVAL'

    * ELSE

        * PREDICT NEXT SOLUTION

        * RESET INTEGRATION CONTROL TO 5
```

```
* CONTROL = 7

    * ADVANCE THE SOLUTIONS MATRIX

    * IF (WE HAVE FOUR VALID PREVIOUS SOLUTIONS) THEN

        * PREDICT NEXT SOLUTION

        * RESET INTEGRATION CONTROL TO 5

    * ELSE

        * SET UP FOR RUNGE-KUTTA INTEGRATIONS

        * RESET INTEGRATION CONTROL TO 1

    * CONTROL = 8

        * SET UP TO USE RUNGE-KUTTA TO GET ANOTHER SOLUTION

        * IF (AT END OF INTERVAL) THEN

            * SET PROGRAM PHASE TO 'END OF INTERVAL'

        * ELSE

            * SET INTEGRATION CONTROL TO 1

* PHASE = 'END OF INTERVAL'

    * RESET PROGRAM PHASE TO INTEGRATION

    * IF (WE HAD TO COMPUTE SOLUTIONS AT A DATA POINT WHICH WAS NOT
      AN INTEGRATION STEP) THEN

        * RESTORE OLD TIME STEP AND TIME

        * RESET INTEGRATION CONTROL TO 7
```

```
*   ELSE
    *   IF (WE HAVE FOUR VALID PREVIOUS SOLUTIONS) THEN
        *   PREDICT NEXT SOLUTION
        *   RESET INTEGRATION CONTROL TO 5
    *   ELSE
        *   SET UP FOR RUNGE-KUTTA INTEGRATIONS
        *   RESET INTEGRATION CONTROL TO 1
*   END
```

* PROGRAM ARTOUT (PRINT SELECTED RESULTS FOR THE ARTILLERY VERSION OF A "COMBAT-II" RUN)

* INITIALIZE "ARTOUT" VARIABLES

* IF (DATA ON TAPE3 IS NOT FROM THE ARTILLERY MODEL) THEN

    * GIVE AN ERROR MESSAGE

    * STOP THE EXECUTION OF THE PROGRAM

* READ FROM TAPE3 THE TITLE, DATE, DESCRIPTION AND TIME RANGE OF THE "COMBAT-II" RUN, CURRENTLY IN PROCESS

* PRINT THE TITLE, DATE AND DESCRIPTION OF THE RUN

* DO UNTIL (AN END-OF-FILE CARD IS ENCOUNTERED)

    * READ A CONTROL CARD CONTAINING THE DISPLAY START TIME, THE TYPE OF INFORMATION TO BE DISPLAYED AND THE "CARD TYPE" PARAMETER. IGNORE CARDS WITH START TIME OUTSIDE THE TIME RANGE OF THE "COMBAT II" RUN

    * WHEN A "CHANGE" CARD IS ENCOUNTERED SET THE SWITH "SWTB" TO THE POSITIVE OR NEGATIVE VALUE IN THE SECOND FIELD OF THE CARD.

    * READ FROM TAPE3 A SET OF "COMBAT II" DATA CORRESPONDING TO THE DISPLAY START TIME AND TO THE TYPE OF DISPLAY INFORMATION SELECTED IN LAST INPUT CARD READ.

    * CASE (TYPE OF INFO SELECTED)

        * TYPE OF INFO = AIRCRAFT STATISTICS (A)

            * INCLUDE (A-TABLES)

        * TYPE OF INFO = MISSILE STATISTICS (M1,M2)

            * INCLUDE (M-TABLES)

        * TYPE OF INFO = AIR BASES STATISTICS (B)

            * INCLUDE (B-TABLES)

        * TYPE OF INFO = GROUND FORCE PACKETS STATISTICS (G1)

            * INCLUDE (G1-TABLES)

        * TYPE OF INFO = SUPPLY PACKET STATISTICS (G2)

            * INCLUDE (G2-TABLES)

```
        * TYPE OF INFO = SUPPLY PACKET STATISTICS (G2)
            * INCLUDE (G2-TABLES)
        * TYPE OF INFO = STATISTICS ON WEAPONS AND THEIR ROUNDS (W/R)
            * INCLUDE (W/R-TABLES)
        * TYPE OF INFO = FEBA MOVEMENT (R FACTORS)
            * INCLUDE (R-FACTOR-TABLES)
        * TYPE OF INFO = UNKNOWN TYPE
            * GIVE ERROR MESSAGE
* END DO
* END ARTOUT
```

```
* PROGRAM AIROUT (PRINT SELECTED RESULTS FOR THE AIR VERSION OF A
  "COMBAT-II" RUN)

* INITIALIZE "AIROUT" VARIABLES

* IF (DATA ON TAPE3 IS NOT FROM THE AIR MODEL) THEN

    * GIVE AN ERROR MESSAGE

    *STOP THE EXECUTION OF THE PROGRAM

* READ FROM TAPE3 THE TITLE, DATE, DESCRIPTION AND TIME RANGE OF THE
  "COMBAT-II" RUN, CURRENTLY IN PROCESS

* PRINT THE TITLE, DATE AND DESCRIPTION OF THE RUN

* DO UNTIL (AN END-OF-FILE CARD IS ENCOUNTERED)

    * READ A CONTROL CARD CONTAINING THE DISPLAY START TIME, THE TYPE OF
      INFORMATION TO BE DISPLAYED AND THE "CARD TYPE" PARAMETER.  IGNORE
      CARDS WITH START TIME OUTSIDE THE TIME RANGE OF THE "COMBAT II" RUN

    * WHEN A "CHANGE" CARD IS ENCOUNTERED SET THE SWITH "SWTB" TO THE
      POSITIVE OR NEGATIVE VALUE IN THE SECOND FIELD OF THE CARD.

    * READ FROM TAPE3 A SET OF "COMBAT II" DATA CORRESPONDING TO THE DISPLAY
      START TIME AND TO THE TYPE OF DISPLAY INFORMATION SELECTED IN LAST
      INPUT CARD READ.

    * CASE (TYPE OF INFO SELECTED)

        * TYPE OF INFO = AIRCRAFT STATISTICS  (A)

            * INCLUDE (A-TABLES)
        * TYPE OF INFO = MISSILE STATISTICS (M1,M2)

            * INCLUDE (M-TABLES)

        * TYPE OF INFO = AIR BASES STATISTICS  (B)

            * INCLUDE (B-TABLES)

        * TYPE OF INFO = GROUND FORCE PACKETS STATISTICS (G1)

            * INCLUDE (G1-TABLES)

        * TYPE OF INFO = SUPPLY PACKET STATISTICS (G2)

            * INCLUDE (G2-TABLES)
```

* TYPE OF INFO = STATISTICS ON SSM AND NUCLEAR WEAPONS AND THEIR ROUNDS (G3/G5, G4/G6)

    * INCLUDE (G3/G5-G4/G6-TABLES)

* TYPE OF INFO = FEBA MOVEMENT (R FACTORS)

    * INCLUDE (R FACTOR TABLES)

* TYPE OF INFO = UNKNOWN TYPE

    * GIVE ERROR MESSAGE

* END DO

* END AIROUT

```
* SEGMENT A TABLES (PRINT AIRCRAFT RELATED DATA AND STATISTICS)

* INITIALIZE "A TABLES" VARIABLES

* DO UNTIL (AT MOST TEN DATA SETS HAVE BEEN PROCESSED)

     * IF (SWITCH "SWTB" IS POSITIVE) THEN

          *OBTAIN PART OF CURRENT COMBAT-II DATA FROM ARRAY "VA"

     * ELSE

          * OBTAIN PART OF CURRENT COMBAT-II DATA FROM ARRAY "DVA"

     * COMPUTE THE DESIRED DISPLAY VARIABLES OF THE SELECTED AIRCRAFT
       SYSTEM FROM THE APPROPRIATE DATA.

     * READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT TIME POINT,
       WHICH IS INDICATED BY THE CURRENT "CARD TYPE" PARAMETER.  (NOTE:
       NEW VALUES IN ARRAYS "VA" AND "DVA")

* END DO

* GENERATE BLOCKS OF PRINTOUT CONTAINING THE VALUES OF SELECTED VARIABLES.
  FOR UP TO TEN TIME POINTS, IN A PREDETERMINED FORMAT.  OMIT CERTAIN BLOCKS
  IF THERE IS NO AIR-TO-GROUND MISSION.

* END A TABLES
```

```
* SEGMENT B TABLES (PRINT DATA AND STATISTICS FOR BASES B1 AND B2)

* INITIALIZE VARIABLES FOR B TABLES

* DO UNTIL (AT MOST TEN DATA SETS HAVE BEEN PROCESSED)

   * IF (SWITCH "SWTB" IS POSITIVE) THEN

      * OBTAIN PART OF CURRENT "COMBAT-II" DATA FROM ARRAY "VA"

   * ELSE

      * OBTAIN PART OF CURRENT "COMBAT-II" DATA FROM ARRAY "DVA"

   * DO UNTIL (BASE B1 AND THEN BASE B2 HAVE BEEN PROCESSED)

      * COMPUTE THE DESIRED DISPLAY VARIABLES FOR THE CURRENT BASE
        (B1 OR B2) FROM THE APPROPRIATE DATA

   * END DO

   * READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT TIME POINT,
     WHICH IS INDICATED BY THE CURRENT "CARD TYPE" PARAMETER.  (NOTE:
     NEW DATA IN ARRAYS "VA" AND "DVA")

* END DO

* DO UNTIL (BASE B1 AND B2 HAVE BEEN PROCESSED)

   * GENERATE BLOCKS OF PRINTOUT CONTAINING THE VALUES OF SELECTED
     VARIABLES FOR UP TO TEN TIME POINTS, IN A PREDETERMINED FORMAT

* END DO

* END B TABLES
```

```
*  SEGMENT M TABLES (PRINT DATA STATISTICS FOR MISSILES M1 AND M2)

*  DO UNTIL (SYSTEM M1 AND THEN M2 HAVE BEEN PROCESSED)

   *  IF (SYSTEM IN PROCESS IS M2) THEN

      *  READ FROM TAPE3 A SET OF "COMBAT-II" DATA CORRESPONDING TO THE
         DISPLAY START TIME AND TO THE TYPE OF DISPLAY INFORMATION
         SELECTED IN LAST INPUT CARD.

   *  INITIALIZE "M TABLES" VARIABLES

   *  DO UNTIL (AT MOST TEN DATA SETS HAVE BEEN PROCESSED)

      *  IF (SWITCH "SWTB" IS POSITIVE) THEN

         *  OBTAIN PART OF CURRENT "COMBAT-II" DATA FROM ARRAY "VA"

      *  ELSE

         *  OBTAIN PART OF CURRENT "COMBAT-II" DATA FROM ARRAY "DVA"

      *  COMPUTE THE DESIRED DISPLAY VARIABLES OF THE CURRENT MISSILE
         SYSTEM FROM THE APPROPRIATE DATA.

      *  READ FROM TAPES A NEW DATA SET CORRESPONDING TO THE NEXT TIME
         POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE" PARAMETER.
         (NOTE:  NEW DATA IN ARRAYS "VA" AND "DVA")

   *  END DO

   *  IF (SOME LAUNCHERS ARE STILL FUNCTIONING OR THE SYSTEM IN PROCESS
      IS M1) THEN

      *  GENERATE BLOCKS OF PRINTOUT CONTAINING THE VALUES OF SELECTED
         VARIABLES, FOR UP TO TEN TIME POINTS, IN A PREDETERMINED
         FORMAT.  OMIT CERTAIN BLOCKS IF THERE ARE NO FUNCTIONING
         LAUNCHERS.

   *  END DO

   *  END M TABLES
```

* SEGMENT G1 TABLES (PRINT DATA AND STATISTICS FOR FORCE PACKETS)

* INITIALIZE VARIABLES FOR G1 TABLES

* DO UNTIL (AT MOST TEN DATA SETS HAVE BEEN PROCESSED)

  * IF (SWITCH "SWTB" IS POSITIVE) THEN

    * OBTAIN PART OF CURRENT "COMBAT-II" DATA FROM ARRAY "VA"

  * ELSE

    * OBTAIN PART OF CURRENT "COMBAT-II" DATA FROM ARRAY "DVA"

  * COMPUTE THE DESIRED DISPLAY VARIABLES OF THE SELECTED FORCE PACKET FROM THE APPROPRIATE DATA.

  * READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE" PARAMETER. (NOTE: NEW DATA IN ARRAYS "VA" AND "DVA")

* END DO

* GENERATE BLOCKS OF PRINTOUT CONTAINING THE VALUES OF SELECTED VARIABLES, FOR UP TO TEN TIME POINTS, IN A PREDETERMINED FORMAT

* END G1 TABLES

* SEGMENT G2 TABLES (PRINT DATA AND STATISTICS FOR FORCE PACKETS)

* INITIALIZE VARIABLES FOR G2 TABLES

* DO UNTIL (AT MOST TEN DATA SETS HAVE BEEN PROCESSED)

    * IF (SWITCH "SWTB" IS POSITIVE) THEN

        * OBTAIN PART OF CURRENT "COMBAT-II" DATA FROM ARRAY "VA"

    * ELSE

        * OBTAIN PART OF CURRENT "COMBAT-II" DATA FROM ARRAY "DVA"

    * COMPUTE THE DESIRED DISPLAY VARIABLES OF THE SELECTED FORCE PACKET FROM THE APPROPRIATE DATA.

    * READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE" PARAMETER. (NOTE: NEW DATA IN ARRAYS "VA" AND "DVA")

* END DO

* GENERATE BLOCKS OF PRINTOUT CONTAINING THE VALUES OF SELECTED VARIABLES, FOR UP TO TEN TIME POINTS, IN A PREDETERMINED FORMAT

* END G2 TABLES

* SEGMENT G3/G5 AND G4/G6 TABLES (PRINT DATA AND STATISTICS FOR FRONTAL SSM AND NUCLEAR ARTILLERY)

* INITIALIZE LOCAL VARIABLES

* DO UNTIL (AT MOST TEN DATA SETS HAVE BEEN PROCESSED)

    * IF (SWITCH "SWTB" IS POSITIVE) THEN

        * OBTAIN PART OF CURRENT "COMBAT-II" DATA FROM ARRAY "VA"

    * ELSE

        * OBTAIN PART OF CURRENT "COMBAT-II" DATA FROM ARRAY "DVA"

    * IF (ANY NUCLEAR ARTILLERY TUBES EXIST) THEN

        * COMPUTE THE DESIRED DISPLAY VARIABLES ASSOCIATED WITH NUCLEAR ARTILLERY FROM THE APPROPRIATE DATA

    * IF (ANY FRONTAL SSM LAUNCHERS EXIST) THEN

        * COMPUTE THE DESIRED DISPLAY VARIABLES ASSOCIATED WITH SSM'S FROM THE APPROPRIATE DATA

    * READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE" PARAMETER. (NOTE: NEW DATA IN ARRAYS "VA" AND "DVA")

* END DO

* ELSE

    * PRINT A MESSAGE INDICATING LACK OF DATA FOR THESE WEAPONS SYSTEMS

* END G3/G5 AND G4/G6 TABLES

* SEGMENT W/R TABLES (PRINT DATA AND STATISTICS FOR THE WEAPON SYSTEMS AND THEIR ROUNDS)

* INITIALIZE LOCAL VARIABLES

* DO UNTIL (AT MOST TEN DATA SETS HAVE BEEN PROCESSED)

    * IF (SWITCH "SWTB" IS POSITIVE) THEN

        * OBTAIN PART OF CURRENT "COMBAT-II" DATA FROM ARRAY "VA"

    * ELSE

        * OBTAIN PART OF CURRENT "COMBAT-II DATA FROM ARRAY "DVA"

    * COMPUTE THE DESIRED DISPLAY VARIABLES OF THE SELECTED WEAPONS AND ROUNDS FROM THE APPROPRIATE DATA

    * READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT TIME POINT WHICH IS INDICATED BY THE CURRENT "CARD TYPE" PARAMETER. (NOTE: NEW DATA IN ARRAYS "VA" AND "DVA")

* END DO

* PRINT THE VALUES OF SELECTED WEAPONS/ROUNDS QUANTITIES FOR UP TO TEN TIME POINTS, IN A PREDETERMINED FORMAT.

* END W/R TABLES

* SEGMENT R FACTOR TABLE (PRINT DATA RELATED TO FEBA MOVEMENT)

* INITIALIZE LOCAL VARIABLES

* DO UNTIL (AT MOST TEN DATA SETS HAVE BEEN PROCESSED)

    * OBTAIN PART OF CURRENT COMBAT-II DATA FROM ARRAY "DVA"

    * COMPUTE THE DESIRED DISPLAY VARIABLES FROM THE APPROPRIATE DATA

    * READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE" PARAMETER. (NOTE: NEW DATA IN ARRAYS "VA" AND "DVA")

* END DO

* PRINT THE VALUES OF SELECTED QUANTITIES, RELATED TO FEBA MOVEMENT, FOR UP TO TEN TIME POINTS, IN A PREDETERMINED FORMAT

* END R FACTOR TABLE

```
* SEGMENT GRAPHC2 (BUILD PRINTED PLOTS OF RESULTS OF A COMII RUN)

* INITIALIZE GRAPHC2 CONTROL VARIABLES

* READ FROM TAPE3 THE MODEL VERSION THAT CREATED THE FILE.

* IF (MODEL VERSION NOT RECOGNIZED)

    * PRINT ERROR MESSAGE

    * STOP EXECUTION

* READ COMII RUN DESCRIPTION AND CONTROL PARAMETERS

* LABEL GRAPHIC OUTPUT (TAPE6) WITH RUN TITLE AND TIME PARAMETERS

* READ FIRST DATA POINT IN APPROPRIATE FORM

* WRITE RUN DESCRIPTION TO TAPE6 IN PAGINATED FORMAT

* READ FIRST GRAPHIC2 CONTROL CARD

* IF (FIRST CARD IS A TLIMIT CARD)

    * IF (TLIMIT TIME SPAN LIMITS NOT WITHIN TIME SPAN OF RUN)

        * SET GRAPHC2 TIME LIMITS TO CONCUR WITH COMII TIME LIMITS AND
          WRITE ERROR MESSAGE AS APPROPRIATE

    * READ NEXT CONTROL CARD

* READ CONTROL CARD FOR VARIABLE INDICES

* ENTER GRAPH TITLE AND VARIABLE INDICES IN TABLE OF CONTENTS ARRAY

* DO UNTIL (LAST GRAPH IS DONE)

    * SET ARRAYS FOR BUILDING GRAPHS TO ZERO

    * INCLUDE (SET UP CONTROL INPUTS FOR NEXT SET OF PLOTS)

    * RESET TAPE3 TO NEXT DATA POINT

    * DO UNTIL (END OF FILE ENCOUNTERED ON TAPE3 OR TIME GREATER THAN TMAX)

        * READ NEXT DATA POINT IN FORM CORRESPONDING TO MODEL VERSION

        * IF (TIME GREATER THAN TMIN)

            * INCLUDE (TRANSFORM DATA FOR CURVE SMOOTHING)

    * END DO
```

```
* DO (FOR EACH PLOT IN THE CURRENT SET)
     * DO (FOR EACH CURVE ON A PLOT)
          * INCLUDE (STORE DATA VALUES AND SCALE DATA)
     * END DO
     * INCLUDE (BUILD PLOT TITLE ON TAPE6)
     * INCLUDE (SCALE PLOT AXES FOR TAPE6)
     * INCLUDE (SMOOTH THE DATA FOR PLOTTING)
     * INCLUDE (RECORD THE PLOT ON TAPE6)
     * INCLUDE (RECORD THE DATA VALUES USED ON TAPE6)
* END DO
```

```
* END DO
* PRINT TABLE OF CONTENTS
* END GRAPHC2
```

APPENDIX C

EXAMPLE JOB CONTROL LANGUAGE

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```
FORMS,STTCZ,T100.
ACCOUNT,        ,     .
REQUEST,TAPE7, *PF.
ATTACH,LGO,FORMBIN,ID=        .
LDSET,PRESET=ZERO.
LGO.
REWIND,TAPE7.
CATALOG,TAPE7,DICTION,ID=        .
/EOR
<ARTILLERY OR AIR CONTROL CARD>
<VARIABLE DEFINITION DECK>
/EOR
<VARIABLE DICTIONARY DECK>
/EOF
```

Example JCL for the FORMS program

```
AR[illegible]CRT,STTCZ,T100.
ACCOUNT,        ,     .
REQUEST,TAPE2,*PF.
REQUEST,TAPE3,*PF.
ATTACH,TAPE7,ARTY7,ID=        .
ATTACH,LGO,COMBATBIN,ID=        .
LDSET,PRESET=ZERO.
LGO.
REWIND,TAPE2.
CATALOG,TAPE2,ARTBASETAPE,ID=        .
REWIND,TAPE3.
CATALOG,TAPE3,ARTY3,ID=        .
/EOR
ARTILLERY
CONTROL   TFTFF  0.0
<INSERT ARTILLERY NAMELIST DECK HERE>
CREATION RUN FOR ARTILLERY
DEQ       .1         .015625   0.01       8.0       100.       .1
<INSERT MODIFY CARDS HERE>
/EOR
/EOF
```

Example JCL for COMII Creation Run

```
AIRBC,STTCZ,T100.
ACCOUNT,        ,       .
REQUEST,TAPE3,*PF.
ATTACH,TAPE1,AIRBASETAPE,ID=        .
ATTACH,TAPE7,AIR7,ID=        .
ATTACH,LGO,COMBATBIN,ID=        .
LDSET,PRESET=ZERO.
LGO.
REWIND,TAPE3.
CATALOG,TAPE3,AIRBASE3,ID=        .
/EOR
AIR
CONTROL   FFTFF  0.0
MODIFIED AIR BASE CASE
DEQ        1.          .0078125  0.01        6.0         96.0        .1
<INSERT MODIFY CARDS HERE>
/EOR
/EOF
```

Example JCL for Normal COMII Run

```
ARTYRS,STCZ,T100.
ACCOUNT,        ,      .
REQUEST, TAPE3,*PF.
ATTACH,TAPE4,ARTYOUT3,ID=        .
ATTACH,TAPE7,ARTY7,ID=        .
ATTACH,LGO,COMBATBIN,ID=        .
LDSET,PRESET=ZERO.
LGO.
REWIND,TAPE3.
CATALOG,TAPE3,ARTY3,ID=        .
/EOR
ARTILLERY
CONTROL   FFTFT  88.0
RESTARTED ARTILLERY BASE CASE
DEQ       1.         .122070   0.01      10.       200.       .1
<INSERT MODIFY CARDS HERE>
/EOR
/EOF
```

Example JCL for Restarted COMII Run

```
ARTOUT,T50,STTCZ.
ACCOUNT,        ,      .
ATTACH,TAPE3,COM11OUT,ID=        .
ATTACH,LGO,ARTOUTBIN,ID=        .
LDSET,PRESET=ZERO.
LGO.
/EOR
TYPE1          10R31
TYPE003         4G12
CHANGE         -1
TYPE002         0G12
/EOF
```

Example JCL for ARTOUT and AIROUT Run.

```
GRAPH,T50,STTCZ.
ACCOUNT,      ,     .
REQUEST,TAPE6,*PF.
ATTACH,TAPE3,COMIIOUT,ID=      .
ATTACH,LGO,GRAPHBIN,ID=      .
LDSET,PRESET=ZERO.
LGO.
REWIND,TAPE6.
COPY,TAPE6,OUTPUT.
/EOR
TLIMIT
            GRAPH RUN
            1100 1120 2000
/EOF
```

Example JCL for GRAPHC2 Run.

APPENDIX D

COMBAT-II SOURCE CODE

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```
      PROGRAM FORMS(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE7,TAPE8,
     1              TAPE9)
C
C            THIS PROGRAM GENERATES INPUTS TO THE COMBAT II MODELS.  THESE
C            INPUTS ARE: A NAMELIST CARD DECK, AN INPUT TAPE FOR THE
C            MODEL, AND TWO BLANK FORMS LISTINGS (WORKING SHEETS).
C            THE FIRST INPUT CARD READ IS EXPECTED TO SPECIFY WHICH
C            MODEL (AIR OR ARTILLERY) IS BEING USED.
C
      COMMON /FILE/ TNAME,TCODE,DSC(7),BN,RN
      DIMENSION NS(3),FILE(11),VNAME(2000),VCODE(2000)
      DIMENSION XNAME(7),ELEMNT(7),ICHK(16),IEQL(16)
      INTEGER COUNT
      DIMENSION DUM(20)
      DIMENSION CARD(2)
      EQUIVALENCE (FILE(1),TNAME)
C
C            INITIALIZE "FORMS" VARIABLES
C
      DATA BLNK/1H /,ICHK/2HLM,2HLL,2HMR,2HKL,2HNK,2HIB,2HKA,2HJA,2HIF,
     1   2HNB,2HJW,2HKR,2HKW,2HIS,2HNA,2HJC/,IEQL/6*2,3*3,4,3*5,15,30,
     2   65/,IBLNK/1H /,NCDS/16/,TYP/1HX/
      SWTA=0
      COUNT=0
      IV=0
C     CHECK WHICH MODEL THIS IS.
      READ (5,99) MODEL
C     IF AIR MODEL, RE-INITIALIZE SOME THINGS
      IF(MODEL.EQ.9HARTILLERY) GO TO 999
      IF(MODEL.EQ.3HAIR) GO TO 998
      WRITE (6,98)
      STOP
  998 NCDS = 12
      ICHK(11)=2HNA
      ICHK(12)=2HJC
      IEQL(11)=10
      IEQL(12)=38
  999 WRITE(9,406)
      WRITE(7) MODEL
 1000 CONTINUE
      IPAGE=1
      NTIMES = -1
      ICNT=100
      LOC=0
      NUM1=1
      NUM2=0
      WRITE (6,200) IPAGE
      IF(SWTA.NE.0) GO TO 1116
 1110 JJ=KK=LL=1
      NJ=NK=NL=0
      IF(TYP.NE.BLNK) VFILE=TYP
C
C            READ A "COMBAT II" VARIABLE, ITS TYPE DESIGNATOR AND ITS THREE
C            SUBSCRIPT DESIGNATORS, IGNORING CARDS WITH BLANK VRBL FIELD
C
      READ(5,101) VAR,TYP,I1,I2,I3
      IF (EOF(5)) 1700,1115
```

```
 1115 CONTINUE
      IF (VAR.EQ.BLNK) GO TO 1110
      IF(VAR.EQ.1HV) GO TO 1700
      IF((VAR.EQ.5HR0001).AND.(TYP.EQ.1HX)) WRITE(9,407)
C
C              CHECK THE VALIDITY OF EACH OF THE THREE SUBSCRIPT DESIGNATORS
C              IF A SUBSCRIPT DESIGNATOR IS NOT ALLOWED PRINT AN ERROR MESSAGE
C              AND STOP PROGRAM EXECUTION. OTHERWISE, FIND THE ALLOWED MAX
C              VALUES FOR THE SET OF SUBSCRIPTS OF THE CURRENT "COMBAT II"
C              VARIABLE FROM ITS SUBSCRIPT DESIGNATORS.
C              SET THE FLAG "ICD" ACCORDING TO THE NUMBER OF SUBSCRIPTS.
C
 1116 DO 1120 I=1,NCDS
      IF (I1.NE.ICHK(I)) GO TO 1120
      JJ=IEQL(I)
      ICD=1
      IF (I.EQ.6) GO TO 1300
      GO TO 1140
 1120 CONTINUE
      IF (I1.NE.IBLNK) GO TO 1130
      ICD=4
      GO TO 1300
 1130 WRITE (6,201) I1
      STOP1
 1140 DO 1160 I=1,NCDS
      IF (I2.NE.ICHK(I)) GO TO 1160
      KK=IEQL(I)
      ICD=2
      IF (I.EQ.6) GO TO 1300
      GO TO 1180
 1160 CONTINUE
      IF (JJ.EQ.ICHK(6)) GO TO 1300
      WRITE (6,201) I2
      STOP2
 1180 IF (I3.EQ.ICHK(6)) GO TO 1200
      IF(I3.EQ.ICHK(10)) GO TO 1190
      WRITE (6,201) I3
      STOP3
 1190 LL=IEQL(10)
      ICD=3
      GO TO 1300
 1200 LL=IEQL(6)
      ICD=3
 1300 CONTINUE
C
C              DO UNTIL MAX VALUE OF EACH SUBSCRIPT IS REACHED.
C
      DO 1600 L=1,LL
      DO 1600 K=1,KK
      DO 1600 J=1,JJ
C
C              GENERATE A SEQUENCE NUMBER AND A SET OF UP TO THREE SUBSCRIPTS
C              FOR THE CURRENT "COMBAT II" VARIABLE.
C
      LOC=LOC+1
C
C              WHEN SEVEN ENCODED VARIABLES HAVE BEEN GENERATED, PRINT THE
```

```
C           ENCODED TYPE X OR P VRBLS AND THEIR SEQUENCE NUMBERS IN A MAX
C           OF SEVEN COLUMNS DISPLAY FORMAT (1ST LISTING OF BLANK FORMS).
C           WRITE THE SAME VRBLS AND SEQUENCE NUMBERS ON TAPE 8 FOR
C           LATER USE (UNFORMATTED).
C
      IF (LOC.LE.7) GO TO 1400
      NTIMES=NTIMES+1
      IF (NTIMES.LE.6) GO TO 1320
      NTIMES=0
      IPAGE=IPAGE+1
      WRITE (6,200) IPAGE
 1320 CONTINUE
      ICNT=ICNT+1
      WRITE (6,205) (M,M=NUM1,NUM2)
      NUM1=NUM2+1
      WRITE (6,202) XNAME
      WRITE (6,203) ELEMNT
      WRITE(6,204) VFILE,ICNT,(M,M=1,7)
      WRITE(8) XNAME,ELEMNT
      LOC=1
 1400 CONTINUE
      NUM2=NUM2+1
C
C           ENCODE THE CURRENT "COMBAT II" VARIABLE, ITS TYPE DESIGNATOR
C           AND THE GENERATED SET OF SUBSCRIPTS ACCORDING TO "ICD" VALUE.
C
      ENCODE(6,408,XNAME(LOC)) VAR,TYP
      GO TO (1410,1420,1430,1440), ICD
 1410 ENCODE (10,301,ELEMNT(LOC)) J
      NJ=J
      ENCODE(10,404,Q) J
      GO TO 1500
 1420 ENCODE (10,302,ELEMNT(LOC)) J,K
      NJ=J
      NK=K
      ENCODE(10,405,Q) J,K
      GO TO 1500
 1430 ENCODE (10,303,ELEMNT(LOC)) J,K,L
      NJ=J
      NK=K
      NL=L
      Q=ELEMNT(LOC)
      GO TO 1500
 1440 ELEMNT(LOC)=BLNK
      Q=ELEMNT(LOC)
C
C           WRITE AN ENCODED TYPE X VARIABLE, IN NAMELIST FORMAT, ON TAPE 9
C           FOR LATER GENERATION OF THE NAMELIST DECK.
C           SAVE A TYPE X VARIABLE (ENCODED WITH ITS TYPE DESIGNATOR) IN AN
C           ELEMENT OF THE ARRAY "VNAME" INDEXED BY THE CURRENT SEQUENCE
C           NUMBER.  SAVE THE CORRESPONDING SET OF GENERATED SUBSCRIPTS
C           (ENCODED SEPARATELY) IN THE ARRAY "VCODE" ALSO INDEXED BY THE
C           CURRENT SEQUENCE NUMBER.
C
 1500 ENCODE(16,402,CARD(1)) XNAME(LOC),Q
      IF(SWTA.EQ.0) WRITE(9,401) CARD(1),CARD(2)
      IF(SWTA.NE.0) GO TO 1600
```

```
      IV=IV+1
      VNAME(IV)=XNAME(LOC)
      ENCODE(6,500,VCODE(IV)) NJ,NK,NL
 1600 CONTINUE
      GO TO 1110
 1700 CONTINUE
C
C             IF LESS THAN SEVEN TYPE X OR P VRBLS HAVE BEEN GENERATED (TAIL
C             ENDS OF TYPE X AND P INPUT STREAM) THEN PRINT THE GENERATED EN-
C             CODED VRBLS IN A DISPLAY FORMAT OF LESS THAN SEVEN COLUMNS (1ST
C             LISTING OF BLANK FORMS)
C             WRITE THE SAME VRBLS AND SEQUENCE NUMBERS ON TAPE 8 FOR LATER USE
C
      ICNT=ICNT+1
      NTIMES=NTIMES+1
      IF (NTIMES.LE.6) GO TO 1720
      NTIMES=0
      IPAGE=IPAGE+1
      WRITE (6,200) IPAGE
 1720 CONTINUE
      WRITE (6,205) (M,M=NUM1,NUM2)
      WRITE (6,202) (XNAME(I),I=1,LOC)
      WRITE (6,203) (ELEMNT(I),I=1,LOC)
      WRITE(6,204) VFILE,ICNT,(M,M=1,7)
      WRITE(8) (XNAME(I),I=1,LOC),(ELEMNT(I),I=1,LOC)
C     USE SWITCH A TO DETERMINE WHETHER WE NEED TO LOOP BACK AND
C     READ VARIABLES BEGINNING WITH A P.
      IF(SWTA.NE.0) GO TO 1750
      SWTA=1
      VFILE=1HP
      COUNT=NUM2
      GO TO 1000
 1750 WRITE(9,403)
C
C             WRITE NUMBER OF GENERATED TYPE X AND P ENCODED VRBLS ON A NEW FILE
C             (TAPE 7) AND ON THE OUTPUT FILE.
C             COPY TAPE 8 ONTO TAPE 7 FOR LATER DUMP ON A MAG TAPE.
C
      REWIND 8
      WRITE(7) COUNT,NUM2
      WRITE(6,1953) COUNT,NUM2
 1953 FORMAT(2(10X,I10))
      I=7
 1800 IF(I.GT.COUNT) I=COUNT
      J=2*I
      READ (8) (DUM(K),K=1,J)
      WRITE(7)  (DUM(K),K=1,J)
      IF(I.EQ.COUNT) GO TO 1850
      COUNT=COUNT-I
      GO TO 1800
 1850 I=7
 1860 IF(I.GT.NUM2) I=NUM2
      J=2*I
      READ(8) (DUM(K),K=1,J)
      WRITE(7) (DUM(K),K=1,J)
      IF(I.EQ.NUM2) GO TO 1900
      NUM2=NUM2-I
```

```
      GO TO 1860
C
C               **NOTE**  THE FOLLOWING IS A LATER ADDITION TO "FORMS", IT READS
C               THE DECK WHICH CONTAINS DESCRIPTIONS OF TYPE X VRBLS AND
C               IT GENERATES THE 2ND LISTING OF BLANK FORMS AND THE MAG TAPE FILE
C
 1900 IVMAX=IV
      IV=IV/2
 1905 IFLG=NFR=NFB=0
      RN=0.0
C
C               READ A "COMBAT II" VRBL (WITH TYPE DESIGNATOR), ITS THREE
C               INDICES AND THE CORRESPONDING NARRATIVE DESCRIPTION.
C
      READ(5,501) TNAME,(NS(I),I=1,3),(DSC(I),I=1,7)
      IF(EOF(5)) 2905,2906
 2905 STOP
 2906 IF(TNAME.EQ.3HEND) GO TO 2905
      DO 2907 I=1,3
 2907 IF(NS(I).EQ.-0) NS(I)=0
      ENCODE(6,500,TCODE)  NS(1),NS(2),NS(3)
C
C               WHEN "SPACE", "TITLE1" OR "TITLE2" IS IN THE VRBL FIELD THEN
C               PRINT PERTINENT COMMENTS, BLANKS OR TITLE ;  WRITE THE SAME
C               INFORMATION ON MAG TAPE FILE (TAPE 7). THEN, MOVE TO READ
C               NEXT CARD.
C
      IF((TNAME.NE.6HTITLE1).AND.(TNAME.NE.6HTITLE2).AND.(TNAME.NE.
     1   5HSPACE)) GO TO 1910
      WRITE(7) FILE
      IF(TNAME.EQ.5HSPACE) GO TO 1906
      IF(TNAME.EQ.6HTITLE1) WRITE(6,503)
      WRITE(6,504) (DSC(I),I=1,7)
      GO TO 1905
 1906 IF(DSC(1).NE.1H ) WRITE(6,505)
      WRITE(6,506) (DSC(I),I=1,7)
      IF(DSC(1).NE.1H ) WRITE(6,505)
      GO TO 1905
C
C               GENERATE THE BLUE AND RED SUBSCRIPT SETS OF THE VRBL FROM ITS
C               THREE INDICES.
C
 1910 IF(NS(1).EQ.-5) GO TO 1929
      IF(NS(3).GT.0) GO TO 1919
      DO 1915 I=1,3
      IF(NS(I).GE.0) GO TO 1915
      NS(I)=1
      IFLG=I
      RN=2.0
      GO TO 1930
 1915 CONTINUE
      RN=2.0
      GO TO 1920
 1919 IFLG=3
      RN=2+NS(3)
      GO TO 1930
 1920 DO 1925 I=1,3
```

```
      IF(NS(I).GT.0) GO TO 1925
      IFLG=I
      NS(I)=1
      GO TO 1930
 1925 CONTINUE
      GO TO 1930
 1929 NS(1)=0
      IFLG=1
 1930 ENCODE(6,500,BCODE) NS(1),NS(2),NS(3)
      NS(IFLG)=RN
      ENCODE(6,500,RCODE) NS(1),NS(2),NS(3)
C
C             COMPARE THE VRBL AND ITS BLUE/RED SETS OF SUBSCRIPTS AGAINST THE
C             PREVIOUSLY SAVED VRBLS (VNAME) AND SUBSCRIPTS (VCODE).
C
 1935 IF((TNAME.EQ.VNAME(IV)).AND.(VNAME(IV).NE.VNAME(IV-1))) GO TO 1940
      IF((TNAME.GT.VNAME(IV)).AND.(TNAME.LT.VNAME(IV+1))) GO TO 1939
      IF((TNAME.LT.VNAME(IV)).AND.(TNAME.GT.VNAME(IV-1))) GO TO 1939
      IF(TNAME.GT.VNAME(IV)) IV=IV+2
      IV=IV-1
      IF((IV.LE.IVMAX).AND.(IV.GT.0)) GO TO 1935
C
C             A COMPLETE MATCH IS NOT FOUND; PRINT ERROR MESSAGE AND
C             READ NEXT CARD.
C
 1939 WRITE(6,507) IV,IVMAX,TNAME,TCODE,BCODE,RCODE
      IV=IVMAX/2
      GO TO 1905
 1940 IVD=1
      IF(VNAME(IV).NE.VNAME(IV+1)) IVD=-1
 1941 IF(BCODE.EQ.VCODE(IV)) GO TO 1945
      IV=IV+IVD
      IF((IV.GT.IVMAX).OR.(IV.LE.0)) GO TO 1939
      GO TO 1941
C
C             A MATCH FOUND FOR BLUE; STORE SEQUENCE NUMBER (IV) FOR
C             BLUE VERSION OF VRBL.
C
 1945 NFB=IV
      BN=IV
 1950 IVD=1
      IF(VNAME(IV).NE.VNAME(IV+1)) IVD=-1
 1951 IF(RCODE.EQ.VCODE(IV)) GO TO 1955
      IV=IV+IVD
      IF((IV.GT.IVMAX).OR.(IV.LE.0)) GO TO 1939
      GO TO 1951
C
C             A MATCH FOUND FOR RED;  STORE SEQUENCE NUMBER (IV) FOR
C             RED VERSION OF VRBL.
C
 1955 NFR=IV
      RN=IV
C
C             A COMPLETE MATCH HAS BEEN FOUND;  PRINT THE VRBL, ITS INDICES
C             THE CORRESPONDING NARRATIVE DESCRIPTION AND THE BLUE/RED SEQ. NUM.
C             A FOUR COLUMNS DISPLAY FORMAT (2ND LISTING OF BLANK FORMS) .
C             WRITE THE SAME INFORMATION ON TAPE 7 (UNFORMATTED).
```

```
C
      WRITE(7) FILE
      DECODE(6,500,TCODE) NS(1),NS(2),NS(3)
      WRITE(6,502) TNAME,(NS(I),I=1,3),(DSC(I),I=1,7),NFB,NFR
C
C              MOVE TO READ NEXT CARD.
C
      GO TO 1905
C
   98 FORMAT (* ERROR -- MODEL TYPE NOT RECOGNIZED.  FIRST CARD MUST *,
     + *CONTAIN THE WORD AIR OR THE WORD ARTILLERY,*)
   99 FORMAT(A10)
  101 FORMAT(A5,A1,2X,3(A2,1X))
  200 FORMAT (*1 NOTE - ALL ENTRIES ARE FLOATING POINT NUMBERS - PUNCH L
     1EFT JUSTIFIED WITH DECIMAL POINTS*,15X,*PAGE*,I3//)
  201 FORMAT (//* ERRONEOUS INPUT VARIABLE SUBSCRIPT - *,A2)
  202 FORMAT (22X,7(A10,5X))
  203 FORMAT (20X,7(A10,5X))
  204 FORMAT(//5X,A1,4HCOEF,I5,7(5X,10(1H-))/6X,7(13X,I1,1HI))
  205 FORMAT (/19X,7(I7,8X))
  301 FORMAT (3X,*(*,I2,*)*,3X)
  302 FORMAT (1X,*(*,I2,*,*,I2,*)*,2X)
  303 FORMAT (  *(*,2(I2,*,*),I2,*)*)
  401 FORMAT(1X,A10,A6,1H=,12X,1H,)
  402 FORMAT(A6,A10)
  403 FORMAT(2H $)
  404 FORMAT(1H(,I2,1H),6X)
  405 FORMAT(1H(,I2,1H,,I2,1H),3X)
  406 FORMAT(6H $XIN1)
  407 FORMAT(2H $/6H $XIN2)
  408 FORMAT(A5,A1)
  500 FORMAT(3I2)
  501 FORMAT(A6,3I2,6A10,A8)
  502 FORMAT(1X,A6,3I3,3X,7A10,3X,*...........(*,I4,*)I ...........(*,
     1   I4,*)*)
  503 FORMAT(1H1,95X,*BLUE*,14X,*RED*)
  504 FORMAT(1X/21X,7A10/1X,13(10H..........))
  505 FORMAT(109X,*I*)
  506 FORMAT(19X,7A10,20X,*I*)
  507 FORMAT(1X/1X,7H*ERROR*/,1X,I4,* HAS REACHED THE LIMITS OF 0 TO*I5,
     1   3X,*LOOKING FOR *,A6,2X,A6,3X,**WITH BLUE AND RED:*,A10,1X,A10/
     2   1X,*NOT WRITTEN TO THE FILE*/)
      END
```

```
      PROGRAM COMII(INPUT,OUTPUT,TAPE1,TAPE2,TAPE3,TAPE4,TAPE5=
     + INPUT,TAPE6=OUTPUT,TAPE7)
C
C     THIS ROUTINE IS THE MAIN FOR THE AIR AND ARTILLERY VERSIONS OF
C     THE COMBAT II MODEL.  IT READS A SINGLE CARD WHICH CONTAINS
C     EITHER THE WORD AIR OR THE WORD ARTILLERY, AND CALLS THE
C     APPROPRIATE SUBROUTINE TO RUN THE MODEL.
C
      READ (5,100) MODEL
  100 FORMAT(A10)
      IF(MODEL.EQ.3HAIR) GO TO 1000
      IF(MODEL.EQ.9HARTILLERY) GO TO 500
C     ERROR OUT
      WRITE(6,200) MODEL
  200 FORMAT(1H1,*ERROR -- INVALID MODEL CARD -- *,A10)
      STOP
  500 CONTINUE
C     ARTILLERY MODEL
      CALL ARTINPT
      STOP
 1000 CONTINUE
C     AIR MODEL
      CALL AIRINPT
      STOP
      END
```

```
      SUBROUTINE AIRINPT
C     AIR MODEL INPUT ROUTINE
C           THIS MODULE READS THE CONTROL CARDS TO DETERMINE THE
C           TYPE OF RUN (CREATION,NORMAL,RESTART) AND THE
C           OUTPUT DESIRED. THE COMMON BLOCKS ARE INITIALIZED AND
C           THE INTEGRATION PARAMETERS ARE READ. ALL MODIFY CARDS
C           WITH A TIME <= THE START TIME SPECIFIED ON THE CONTROL
C           CARD ARE READ AND THE DESIRED VALUE CHANGES MADE
C           PRIOR TO RUNNING THE MODEL.
      COMMON /XCOEF/ C0010X(2),C0020X(2),C0030X(2),C0040X(2),C0050X(2,2)
     1,C0211X(3,2),C0212X(3,2),C0213X(3,2),C0214X(3,2),C0215X(3,2,2),C02
     231X(2,2),C0232X(2,2),C0233X(2,2),C0234X(2,2),C0235X(2,2,2),C0242X(
     32),C0243X(2),C0244X(2),C0245X(2),C0251X(2),C0252X(2),C0253X(2),C02
     454X(2),C0255X(2,2),C0261X(2),C0262X(2),C0263X(2),C0264X(2),C0265X(
     52,2),C0307X(2,2,2),C0406X(2),C0407X(2),C0511X(2),C0512X(2,2),C0513
     6X(2,2),C0521X(2),C0522X(2)   ,C0551X(2),C0552X(2),C0601X,C0603X(3,2
     7),C0604X(2),C0605X(2),C0606X(2),C0607X(2),C0610X(2),C0611X(2),C061
     83X(2),C0614X(2),E0511X(2),E0512X(3,2,2),E052
     91X(2),F0001X(3,2),F0101X(3,2),F0102X(2),F0103X(2),F0104X(3,2),F010
     *5X(3,2),F0106X(3,2),F0107X(3,2,2),F0108X(3,2,2),F0109X(2),F0201X(3
     1,3,2),F0202X(3,3,2),F0301X(2,2),
     *F0302X(2,3,2),F0303X(2,3,2),F0304X(2,2),F0305X(2,2),F0306X(2,2,2),
     1F0307X(2,2),F0308X(2,2,2),F0401X(3,2),
     2F0402X(3,2),F0601X(3,2),P0001X(3,3,2),P0002X(3,3,2),P0003X(3,3,2),
     3P0004X(3,3,2),P0101X(3,2,2),P0102X(3,2,2),P0103X(3,2),P0104X(3,2),
     4P0105X(3,2), P0107X(3,2),P0108X(2,3,2),P0109X(2,3,2),P0301X(2,2),P
     50302X(2,2),P0303X(2,2),P0304X(2,2),P0305X(2,2,2),P0306X(2,2),P0307
     6X(2,2,2),P0323X(3,2,2),P0324X(3,2,2),P0325X(3,2,2),P0326X(3,2,4),
     7 P0327X(3,2,4),P0401X(2),P0402X(2),P0403X(2),P0404X(2),P0405X(2)
C
      COMMON /XCOEF/ R0001X(2,3,2),R0301X(2,2),R0401X(2),R0402X(2),
     1R0571X(2,3,2),R0572X(2,2,2),R0574X(2),R0575X(2),R0576X(2),
     2R0577X(2),R0578X(2,2),R0579X(2,2),R0601X,R0602X(2),R0603X(2),
     3R0604X(2),R0605X(2),R0700X(2,2),V0541X(2,2),V0545X(2,2),
     4V0551X(2),V0552X(2),V0601X(3,2),V0(38,2)
      COMMON/PV/X1(1252)
      COMMON/PDV/X2(792)
C
      COMMON /XINTEG/ TINC,DELT,ERROR,DTINER,TOUTER,TEND,CARD(8),ALPHA
      COMMON/DICT/PNAME(1275),PELMNT(1275),SWT3,QX1,QX2
      COMMON/DICT2/XNAME(792),ELEMNT(792)
      COMMON /FILE/ TNAME,TCODE,DSC(7),BN,RN
      DIMENSION NS(3),FILE(11)
      DIMENSION XCOEF(1),INDEX(4),VAL(4)
      DIMENSION TITLE(6),TITLED(6)
      DIMENSION TIT1(3),TIT2(3),TIT3(3),TIT4(3),TIT5(3),DSCRPT(8)
     1    ,TYPE(4)
      LOGICAL RFLG,OFLG,DFLG,TFLG,BFLG,IER
      EQUIVALENCE(FILE(1),TNAME)
      EQUIVALENCE(XCOEF(1),C0010X(1))
      NAMELIST /XIN1/ C0010X,C0020X,C0030X,C0040X,C0050X,C0211X,
     1C0212X,C0213X,C0214X,C0215X,C0231X,C0232X,
     2C0233X,C0234X,C0235X,         C0242X,C0243X,
     *C0244X,C0245X,C0251X,C0252X,C0253X,C0254X,
     *C0255X,C0261X,C0262X,C0263X,C0264X,C0265X,
     *C0307X,        C0406X,C0407X,
     3C0511X,C0512X,C0513X,      C0521X,C0522X,C0551X,C0552X,
```

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     4C0601X,C0603X,C0604X,C0605X,C0606X,C0607X,
     5C0610X,C0611X,C0613X,C0614X,E0511X,E0512X,
     6E0521X,F0001X,F0101X,F0102X,
     7F0103X,F0104X,F0105X,F0106X,F0107X,F0108X,
     8F0109X,F0201X,F0202X,F0301X,F0302X,F0303X,F0304X,F0305X,
     9F0306X,F0307X,F0308X,F0401X,F0402X,
     *F0601X,P0001X,P0002X,P0003X,P0004X,P0101X,
     1P0102X,P0103X,P0104X,P0105X,P0107X,P0108X,
     2P0109X,P0301X,P0302X,P0303X,P0304X,P0305X,
     3P0306X,P0307X,P0323X,P0324X,P0325X,P0326X,
     5P0327X,P0401X,P0402X,P0403X,P0404X,P0405X
      NAMELIST /XIN2/ R0001X,R0301X,R0401X,R0402X,R0571X,R0572X,
     1R0574X,R0575X,R0576X,R0577X,R0578X,
     2R0579X,R0601X,R0602X,R0603X,R0604X,R0605X,
     3R0700X,V0541X,V0545X,V0551X,V0552X,V0601X,V0
      DATA (TITLE(I),I=1,2)/10HCOMBAT II ,10HAIR MODEL /
      DATA TIT1/10HCONTROL PA,10HRAMETERS  ,10H          /
      DATA TIT2/10HINITIAL CO,10HEFFICIENT ,10HVALUES    /
      DATA TIT3/10HDEQ INTEGR,10HATER VALUE,10HS         /
      DATA TIT4/10HMODIFIED C,10HOEFFICIENT,10H VALUES   /
      DATA TIT5/10HRUN DESCRI,10HPTION:    ,10H          /,
     1   DSCEND/10HEND       /
      DATA TYPE/10HCONTROL   ,10HXCOEF     ,10HDEQ       ,
     1   10HMODIFY    /
      DATA NDV/798/,SWT3/0/
      PRINT 1
    1 FORMAT (1H-)
      IER=.FALSE.
      CALL XDATE(DATE)
C
C     READ CONTROL CARD FOR THE RUN
C
      READ(5,100)TYP,RFLG,OFLG,DFLG,TFLG,BFLG,TT
C        RFLG   - READ CONTROL (T-INPUT NEW DATA SET)
C        OFLG   - OUTPUT CONTROL FLAG (T-OUTPUT ALL PARAMETERS
C        DFLG   - DEQ CONTROL FLAG(T-OUTPUT DEQ/TIME RECORD)
C        TFLG   - INPUT TABLES CONTROL FLAG (T- TO DISPLAY)
C        BFLG   - RESTART FLAG (F - FOR A NEW GAME)
C        TT     - START TIME OF GAME
      IF (TYP.EQ.TYPE(1)) GO TO 1120
      WRITE(6,300) TYP,RFLG,OFLG,DFLG,TFLG,TITLE
      WRITE (6,301) TYPE(1)
      IER=.TRUE.
 1120 CALL LCHPTR (TITLE,1H ,10,DATE,-1,60)
      IF(DFLG) SWT3=1
      CALL REMARK(10H          )
      CALL REMARK(10HRUN TITLE:)
      CALL REMARK(TITLE)
      CALL REMARK(10H          )
      NL=0
      CALL LCHPTR (1H ,TIT1,30,DATE,NL,-55)
      WRITE(6,201) RFLG,OFLG,DFLG,TFLG
C
C     ERROR CHECK FOR CORRECT TAPE
C
      READ(7) MODEL
      IF(MODEL.EQ.3HAIR) GO TO 1150
```

```
      WRITE(6,150) MODEL
      STOP2
 1150 READ(7) NXCOEF,NV
      IF (BFLG) GO TO 1205
      IF (RFLG) GO TO 1200
C
C     NORMAL RUN - READ BASE CASE VALUES FROM TAPE 1
C
      READ(1) MODEL
      IF(MODEL.EQ.3HAIR) GO TO 1190
      WRITE(6,150) MODEL
      STOP 2
 1190 READ (1) TITLEO,DATEO,(XCOEF(I),I=1,NXCOEF)
      WRITE (6,202) TITLEO,DATEO
      GO TO 1210
C
C     CREATION RUN - READ THE BASE CASE VALUES FROM CARDS
C
 1200 CONTINUE
      READ(5,XIN1)
      READ(5,XIN2)
      WRITE(2) 10HAIR
      WRITE (2) TITLE,DATE,(XCOEF(I),I=1,NXCOEF)
      GO TO 1210
C
C     RESTART RUN - READ THE INITIAL VALUES FROM A RESTART TAPE
C
 1205 READ(4) MODEL
      IF(MODEL.EQ.3HAIR) GO TO 1206
      WRITE(6,150) MODEL
      STOP 2
 1206 READ(4) (DSCRPT(K), K=1,8)
      IF(DSCRPT(1).NE.DSCEND) GO TO 1206
      READ(4) TITLEO,DATEO,DUMMY
C
C     RESTART RUN - READ THE TAPE UNTIL THE START TIME FOUND
C
 1207 READ(4) TIME, (XCOEF(I), I=1,NXCOEF), (X1(I),I=1,NV),
     +(X2(I), I=1,NDV)
      IF(TIME.LT.TT) GO TO 1207
      WRITE(6,202) TITLEO,DATEO
C
C     IF INITIAL COEFFIECENTS DESIRED THEN PRINT THEM
C
 1210 CONTINUE
      IF(.NOT.OFLG) GO TO 1215
      NL=0
      CALL LCHPTR (1H ,TIT2,30,DATE,NL,-55)
      NTIMES=0
 1215 NCARDS=((NXCOEF-1)/7)+1
      J2=0
      DO 1260 I=1,NCARDS
      J1=J2+1
      J2=J2+7
      IF (I.EQ.NCARDS) J2=NXCOEF
      NTIMES=NTIMES+1
      IF (NTIMES.LE.7) GO TO 1220
```

```
      NTIMES=1
      IF(.NOT.OFLG) GO TO 1220
      NL=0
      CALL LCHPTR (1H ,TIT2,30,DATE,NL,-55)
 1220 READ (7) (XNAME(J),J=J1,J2),(ELEMNT(J),J=J1,J2)
      IF (.NOT.OFLG) GO TO 1260
      WRITE (6,203) (J,J=J1,J2)
      WRITE (6,204) (XNAME(J),J=J1,J2)
      WRITE (6,210) (ELEMNT(J),J=J1,J2)
      WRITE (6,205) (XCOEF(J),J=J1,J2)
      K=100+I
      WRITE (6,206) K,(M,M=11,71,10)
 1260 CONTINUE
      NCARDS=((NV-1)/7)+1
      J2=0
      DO 1265 I=1,NCARDS
      J1=J2+1
      J2=J2+7
      IF(I.EQ.NCARDS) J2=NV
 1265 READ (7) (PNAME(J),J=J1,J2),(PELMNT(J),J=J1,J2)
C
C     READ RUN DESCRIPTION
C     AND PRINT DESCRIPTION ON OUTPUT TAPE AND PRINTER
C
      NL=0
      WRITE(3) 10HAIR
 1270 CALL LCHPTR(1H ,TIT5,30,DATE,NL,-55)
      NTIMES=1
 1280 READ(5,402) DSCRPT
      IF(EOF(5)) 1300,1290
 1290 IF(DSCRPT(1).EQ.3HDEQ) GO TO 1310
      WRITE(6,403) DSCRPT
      WRITE(3) (DSCRPT(I),I=1,8)
      NTIMES=NTIMES+1
      IF(NTIMES.GT.25) GO TO 1270
      GO TO 1280
 1300 WRITE(6,404)
      WRITE(6,301) TYPE(3)
      IER=.TRUE.
      GO TO 3000
C
C     ALL THE DESCRIPTION HAS BEEN READ AND THE DEQ CARD FOUND
C
 1310 WRITE(3) DSCEND,(DSCRPT(J),J=2,8)
      IF(.NOT.TFLG) GO TO 1335
 1315 READ(7) FILE
      IF(EOF(7)) 1335,1320
 1320 IF(TNAME.EQ.5HSPACE) GO TO 1325
      IF((TNAME.NE.6HTITLE1).AND.(TNAME.NE.6HTITLE2)) GO TO 1330
      NL=0
      IF(TNAME.EQ.6HTITLE1)  CALL LCHPTR(1H ,TIT2,30,DATE,NL,-55)
      IF(TNAME.EQ.6HTITLE1) WRITE(6,504)
      WRITE(6,507) (DSC(I),I=1,7)
      GO TO 1315
 1325 IF(DSC(1).NE.1H ) WRITE(6,505)
      WRITE(6,506) (DSC(I),I=1,7)
      IF(DSC(1).NE.1H ) WRITE(6,505)
```

```
      GO TO 1315
 1330 NFB=BN
      NFR=RN
      BN=XCOEF(NFB)
      RN=XCOEF(NFR)
      DECODE(6,500,TCODE) NS(1),NS(2),NS(3)
      DO 1331 I=1,3
      IF((NS(I).GE.0).OR.(NS(I).LT.-2)) GO TO 1331
      BN=1.0-BN
      RN=1.0-RN
 1331 CONTINUE
      WRITE(6,502)TNAME,(NS(I),I=1,3),(DSC(I),I=1,7),BN,NFB,RN,NFR
      GO TO 1315
 1335 CONTINUE
C
C     DECODE THE INTEGRATION PARAMETERS
C
      DECODE(80,103,DSCRPT(1)) TYP,TINC,DELT,ERROR,DTINER,TEND,ALPHA
C         TINC    - MAXIMUM INTEGRATION INTERVAL ALLOWED
C         DELT    - INITIAL INTERVAL DT
C         ERROR   - ERROR PARAMETER SPECIFICATION FOR DEQ
C         DTINER  - INNER LOOP DT
C         TEND    - END OF INTEGRATION TIME
C         ALPHA   - SCALE FACTOR FOR ACQUISITION EQ.S
      NL=0
      CALL LCHPTR (1H ,TIT3,30,DATE,NL,-55)
      WRITE(6,207) TINC,DELT,ERROR,DTINER,TEND,ALPHA
C
C     READ IN THE MODIFY CARDS UNTIL A CHANGE TIME > THE
C     THE GAME START TIME IS FOUND
C
      NL=0
      TOUTER=TEND
 1650 READ(5,104) CARD
      IF(EOF(5)) 2500,1700
 1700 IF(CARD(1).EQ.TYPE(4)) GO TO 1800
      WRITE (6,302) CARD
      WRITE (6,301) TYPE(4)
      IER=.TRUE.
      GO TO 1650
C
C    DECODE THE MODIFY CARD AND CHECK THE CHANGE TIME
C
 1800 DECODE (70,401,CARD(2)) TIME,(INDEX(I),VAL(I),I=1,4)
C        TIME    - TIME AT WHICH CHANGE IS TO TAKE PLACE
C        INDEX   - INDEX OF PARAMETER BEING MODIFIED
C        VAL     - NEW PARAMETER VALUE
      IF (TIME.GT.0.0) GO TO 2000
      DO 1860 I=1,4
      IF (INDEX(I).LE.0) GO TO 1860
      K=INDEX(I)
C     MODIFY THE INITIAL VALUE IN THE COMMON USING THE INDEX NUMBER
      XCOEF(K)=VAL(I)
      CALL LCHPTR (1H ,TIT4,30,DATE,NL,-55)
      IF (NL.EQ.2) WRITE (6,208) TIME
      WRITE (6,209) K,XNAME(K),ELEMNT(K),VAL(I)
 1860 CONTINUE
```

```
      READ (5,104) CARD
      IF (EOF(5)) 2500,1700
 2000 TOUTER=TIME
      GO TO 3000
 2500 TOUTER=TEND
 3000 CONTINUE
      IF (IER) STOP5
      WRITE(3) TITLE,DATE,TINC,DELT,ERROR,DTINER,TOUTER,TT,TEND,ALPHA
      IF(.NOT.BFLG) TT=-TT
C
C     BEGIN THE SIMULATION
C
      CALL AIRMODL(DATE,INDEX,VAL,NXCOEF,NV,TT,NDV)
C
  100 FORMAT(A10,5L1,F5.0,6A10)
  103 FORMAT(A10,6F10.0)
  104 FORMAT (8A10)
  150 FORMAT(//10H ERROR ***, *MODEL TYPE NOT RECOGNIZED: *,
     +A10, *; EXPECTED TYPE - AIR*)
  201 FORMAT(///10X,*READ FLAG = *,L3///10X,*OUTPUT FLAG = *,L3///10X,
     1    *TIME RECORD FLAG = *,L3///10X,*INPUT TABLES FLAG = *,L3)
  202 FORMAT (///10X,*INPUT DATA SET TITLE = *,6A10,///10X,*INPUT DATA S
     1ET DATE = *,A10)
  203 FORMAT (/19X,7(I7,8X))
  204 FORMAT (22X,7(A10,5X))
  205 FORMAT (1H0,17X,7(E13.6,2X))
  206 FORMAT (  5X,*XCOEF*,I5,7(5X,10(1H-)),/6X,7(13X,I2))
  207 FORMAT (///10X,*TINC =  *,F10.5,//10X,*DELT =  *,F10.5,//10X,
     1    *ERROR = *,F10.5,//10X,*DTINER =*,F10.5,//10X,
     2    *TEND =  *,F10.5//10X,*ALPHA = *,F10.5)
  208 FORMAT (//* PARAMETERS MODIFIED AT TIME = *,F10.5//)
  209 FORMAT (10X, *XCOEF(*,I3,*) = *,2A10,* = *,E13.6)
  210 FORMAT (20X,7(A10,5X))
  300 FORMAT(15X,A10,4L1,8X,6A10)
  301 FORMAT(//1X,5H*****,* ABOVE CARD MISPLACED OR UNIDENTIFIABLE*,
     1    5X,*EXPECTED CARD TYPE *,A10)
  302 FORMAT (//5X,8A10)
  401 FORMAT (F10.0,4(I5,F10.0))
  402 FORMAT(8A10)
  403 FORMAT(1X/,21X,8A10)
  404 FORMAT(1H1//3X,15H* END OF FILE *)
  500 FORMAT(3I2)
  502 FORMAT(1X,A6,3I3,3X,7A10,3X,F11.4,*(*,I4,*)I *,F11.4,*(*,I4,*)*)
  504 FORMAT(1X/95X,*BLUE*,14X,*RED*)
  505 FORMAT(109X,*I*)
  506 FORMAT(19X,7A10,20X,*I*)
  507 FORMAT(1X/21X,7A10/1X,13(10H..........))
      END
```

```
      SUBROUTINE ARTINPT
C
C      ARTILLERY MODEL INPUT ROUTINE
C             THIS MODULE READS THE CONTROL CARDS TO DETERMINE
C             THE TYPE OF RUN (CREATION,NORMAL,RESTART) AND THE
C             OUTPUT DESIRED. THE COMMON BLOCKS ARE INITALIZED
C             AND THE INTEGRATION PARAMETERS ARE READ. ALL MODIFY
C             CARDS WITH A TIME <= THE START TIME  SPECIFIED IN THE
C             FIRST CARD WILL BE READ AND THE APPROPRIATE CHANGES
C             MADE PRIOR TO RUNNING THE MODEL.
      COMMON /XCOEF/ C0010X(2),C0020X(2),C0030X(2),C0040X(2),
     1   C0050X(2,2),C0060X(5,2),C0070X(5,2),C0211X(3,2),C0212X(3,2),
     2   C0213X(3,2),C0214X(3,2),C0215X(3,2,2),C0216X(3,5,2),
     3   C0217X(3,5,2),C0231X(2,2),C0232X(2,2),C0233X(2,2),C0234X(2,2),
     4   C0235X(2,2,2),C0236X(2,5,2),C0237X(2,5,2),C0242X(5,2),
     5   C0243X(5,2),C0244X(5,5,2),C0251X(2),C0252X(2),C0253X(2),
     6   C0254X(2),C0255X(2,2),C0256X(5,2),C0257X(5,2),C0261X(2),
     7   C0262X(2),C0263X(2),C0264X(2),C0265X(2,2),C0266X(5,2),
     8   C0267X(5,2),C0307X(2,2,2),C0511X(2),C0512X(2,2),C0513X(2,2),
     9C0521X(2),C0522X(2),C0523X(5,2),C0601X,C0603X(3,2),C0604X(2),C0605
     *X(2),C0606X(2),C0607X(2),C0610X(5,2),C0611X(5,2),C0612X(5,2),
     1   E0511X(2),E0512X(2),E0513X(2,2),E0514X(2,2),E0521X(2),
     2   F0001X(3,2),F0101X(3,2),F0102X(2),F0103X(2),F0104X(3,2),
     3   F0105X(3,2),F0106X(3,2),F0107X(3,2,2),F0108X(3,2,2),F0109X(2),
     4   F0110X(5,2),F0111X(3,5,2),F0201X(3,3,2),F0202X(3,3,2),
     5   F0203X(3,15,2),F0301X(2,2),F0302X(2,3,2),
     6   F0303X(2,3,2),F0304X(2,2),F0305X(2,2),F0306X(2,2,2),
     7F0307X(2,2),F0308X(2,2,2),F0309X(3,2,2),F0310X(2,15,2),F0311X(2,5,
     82),F0312X(2,3,2),F0402X(5,2),F0403X(5,2),F0404X(5,5,2)
C
      COMMON /XCOEF/ F0601X(3,2),P0001X(3,3,2),P0002X(3,3,2),
     1   P0003X(3,3,2),P0004X(3,3,2),P0101X(3,2,2),P0102X(3,2,2),
     2   P0103X(3,2),P0104X(3,2),P0105X(3,2),P0107X(3,2),P0108X(2,3,2),
     3   P0109X(2,3,2),P0110X(5,3,2)                ,P0301X(2,2),
     4   P0302X(2,2),P0303X(2,2),P0304X(2,2),P0305X(2,2,2),P0306X(2,2),
     5   P0307X(2,2,2),P0308X(2,5,2),P0309X(2,5,2),P0323X(3,2,2),
     6   P0324X(3,2,2),P0325X(3,2,2),P0326X(3,2,4),P0327X(3,2,4),
     7   P0328X(3,5,4),P0329X(3,5,4),P0401X(2),P0402X(5,2),P0403X(5,2),
     8   P0404X(5,5,2),R0001X(3,2),R0301X(2,2),R0402X(5,2),
     9   R0571X(3,2),R0572X(2),R0573X(2),R0574X(2),R0575X(2),
     *   R0576X(5,2),R0577X(5,2),R0578X(2,2),R0579X(2,2),R0601X,
     1   R0602X(2),R0603X(2),R0604X(5,2),R0605X(5,2),R0700X(2,2),
     2   V0541X(2,2),V0545X(2,2),V0551X(5,2),V0601X(3,2),V0602X(5,3,2),
     3   V0700X(2),V0(65,2)
       COMMON /PV/ X1(3236)
       COMMON /PDV/ X2(1950)
C
C
      COMMON /XINTEG/ TINC,DELT,ERROR,DTINER,TOUTER,TEND,CARD(8),ALPHA
      COMMON/DICT/PNAME(3236),PELMNT(3236),SWT3,QX1,QX2,
     1  QX3,FLOWAD(5,2),QR,QF,QA
      COMMON /FILE/ TNAME,TCODE,DSC(7),BN,RN
      DIMENSION SWT2(2)
      DIMENSION NS(3),FILE(11)
      COMMON /DICT2/  XNAME(1700),ELEMNT(1700)
      DIMENSION XCOEF(1682),INDEX(4),VAL(4)
      DIMENSION TITLE(6),TITLED(6)
```

```
      DIMENSION TIT1(3),TIT2(3),TIT3(3),TIT4(3),TIT5(3),DSCRPT(8)
     1    ,TYPE(4)
      LOGICAL RFLG,OFLG,DFLG,TFLG,BFLG,IER
      EQUIVALENCE(FILE(1),TNAME)
      EQUIVALENCE(XCOEF(1),C0010X(1))
      NAMELIST /XIN1/ C0010X,C0020X,C0030X,C0040X,C0050X,C0060X,C0070X,
     1    C0211X,C0212X,C0213X,C0214X,C0215X,C0216X,C0217X,C0231X,
     2    C0232X,C0233X,C0234X,C0235X,C0236X,C0237X,C0242X,C0243X,
     3    C0244X,C0251X,C0252X,C0253X,C0254X,C0255X,C0256X,C0257X,
     4    C0261X,C0262X,C0263X,C0264X,C0265X,C0266X,C0267X,C0307X,
     5    C0511X,C0512X,C0513X,C0521X,C0522X,C0523X,C0601X,C0603X,C0604X,
     6    C0605X,C0606X,C0607X,C0610X,C0611X,C0612X,E0511X,F0512X,
     7    E0513X,E0514X,E0521X,F0001X,F0101X,F0102X,F0103X,F0104X,
     8    F0105X,F0106X,F0107X,F0108X,F0109X,F0110X,F0111X,F0201X,
     9    F0202X,F0203X,F0301X,F0302X,F0303X,F0304X,F0305X,F0306X,
     *    F0307X,F0308X,F0309X,F0310X,F0311X,F0312X,F0402X,F0403X,F0404X,
     1    F0601X,P0001X,P0002X,P0003X,P0004X,P0101X,P0102X,P0103X,
     2    P0104X,P0105X,P0107X,P0108X,P0109X,P0110X,
     3    P0301X,P0302X,P0303X,P0304X,P0305X,P0306X,P0307X,P0308X,
     4    P0309X,P0323X,P0324X,P0325X,P0326X,P0327X,P0328X,P0329X,
     5    P0401X,P0402X,P0403X,P0404X
      NAMELIST /XIN2/ R0001X,R0301X,R0402X,R0571X,R0572X,R0573X,
     1    R0574X,R0575X,R0576X,R0577X,R0578X,R0579X,R0601X,R0602X,
     2    R0603X,R0604X,R0605X,R0700X,V0541X,V0545X,V0551X,V0601X,V0602X,
     3    V0700X,V0
      DATA TIT1/10HCONTROL PA,10HRAMETERS  ,10H          /
      DATA TIT2/10HINITIAL CO,10HEFFICIENT ,10HVALUES    /
      DATA TIT3/10HDEQ INTEGR,10HATER VALUE,10HS         /
      DATA TIT4/10HMODIFIED C,10HOEFFICIENT,10H VALUES   /
      DATA TIT5/10HRUN DESCRI,10HPTION:    ,10H          /,
     1    DSCEND/10HEND       /
      DATA TYPE/10HCONTROL   ,10HXCOEF     ,10HDEQ       ,
     1    10HMODIFY    /
      DATA SWT2/1,1/,NDV/1950/
      DATA (TITLE(I),I=1,3)/9HCOMBAT II,9HARTILLERY,5HMODEL/
      PRINT 1
    1 FORMAT (1H-)
      IER=.FALSE.
      CALL XDATE(DATE)
C
C     READ CONTROL CARD
C
      READ(5,100)TYP,RFLG,OFLG,DFLG,TFLG,BFLG,TT
C         RFLG    - READ CONTROL (T=INPUT NEW DATA SET)
C         OFLG    - OUTPUT CONTROL FLAG (T=OUTPUT ALL PARAMETERS
C         DFLG    - DEQ CONTROL FLAG(T=OUTPUT DEQ/TIME RECORD)
C         TFLG    - INPUT TABLES CONTROL FLAG (T= TO DISPLAY)
C         BFLG    - BEGIN FROM OLD TAPE FLAG(F=FOR A NEW GAME)
C         TT      - START TIME OF GAME
      IF (TYP.EQ.TYPE(1)) GO TO 1120
      WRITE(6,300) TYP,RFLG,OFLG,DFLG,TFLG,BFLG,TT,TITLE
      WRITE (6,301) TYPE(1)
      IER=.TRUE.
 1120 CALL LCHPTR (TITLE,1H ,10,DATE,-1,60)
      IF(DFLG) SWT3=1
      CALL REMARK(10H          )
      CALL REMARK(10HRUN TITLE:)
```

```
      CALL REMARK(TITLE)
      CALL REMARK(10H          )
      NL=0
      CALL LCHPTR (1H ,TIT1,30,DATE,NL,-55)
      WRITE(6,201) RFLG,OFLG,DFLG,TFLG,BFLG
      IF(TT.LE.0.0) TT=0.0
C     ERROR CHECK FOR CORRECT DICTIONARY TAPE
      READ(7) MODEL
      IF(MODEL.EQ.9HARTILLERY) GO TO 1150
      WRITE(6,150) MODEL
      STOP2
 1150 READ(7) NXCOEF,NV
      IF(BFLG) GO TO 1205
      IF (RFLG) GO TO 1200
C
C     NORMAL RUN - READ BASE CASE FROM TAPE 1
C
      READ(1) MODEL
      IF (MODEL.EQ.9HARTILLERY) GO TO 1190
      WRITE (6,150) MODEL
      STOP2
 1190 READ (1) TITLEO,DATEO,(XCOEF(I),I=1,NXCOEF)
      WRITE (6,202) TITLEO,DATEO
      GO TO 1210
C
C     CREATION RUN - READ NEW BASE CASE VALUES FROM CARDS
C
 1200 CONTINUE
      READ(5,XIN1)
      READ(5,XIN2)
      WRITE(2) 10HARTILLERY
      WRITE (2) TITLE,DATE,(XCOEF(I),I=1,NXCOEF)
      GO TO 1210
C
C     RESTART MODEL FROM AN OUTPUT TAPE
C
 1205 READ(4) MODEL
      IF(MODEL.EQ.9HARTILLERY) GO TO 1206
      WRITE (6,150) MODEL
      STOP2
 1206 READ(4) (DSCRPT(K),K=1,8)
      IF(DSCRPT(1).NE.DSCEND) GO TO 1206
      READ(4) TITLEO,DATEO,DUM
C     RESTART - READ TAPE UNTIL RESTART TIME FOUND
 1207 READ(4) TIME,(XCOEF(I),I=1,NXCOEF),(X1(I),I=1,NV),(X2(I),I=1,NDV),
     1     SWT2(1),SWT2(2)
      IF(TIME.LT.TT) GO TO 1207
      WRITE(6,202) TITLEO,DATEO
 1210 CONTINUE
C     IF INITIAL COEFFICENTS  OUTPUT DESIRED THEN
      IF(.NOT.OFLG) GO TO 1215
      NL=0
      CALL LCHPTR (1H ,TIT2,30,DATE,NL,-55)
      NTIMES=0
 1215 NCARDS=((NXCOEF-1)/7)+1
      J2=0
      DO 1260 I=1,NCARDS
```

```
      J1=J2+1
      J2=J2+7
      IF (I.EQ.NCARDS) J2=NXCOEF
      NTIMES=NTIMES+1
      IF (NTIMES.LE.7) GO TO 1220
      NTIMES=1
      IF(.NOT.OFLG) GO TO 1220
      NL=0
      CALL LCHPTR (1H ,TIT2,30,DATE,NL,-55)
C     PRINT OUT INITIAL COEFFICENTS
 1220 READ (7) (XNAME(J),J=J1,J2),(ELEMNT(J),J=J1,J2)
      IF (.NOT.OFLG) GO TO 1260
      WRITE (6,203) (J,J=J1,J2)
      WRITE (6,204) (XNAME(J),J=J1,J2)
      WRITE (6,210) (ELEMNT(J),J=J1,J2)
      WRITE (6,205) (XCOEF(J),J=J1,J2)
      K=100+I
      WRITE (6,206) K,(M,M=11,71,10)
 1260 CONTINUE
      NCARDS=((NV-1)/7)+1
      J2=0
      DO 1265 I=1,NCARDS
      J1=J2+1
      J2=J2+7
      IF(I.EQ.NCARDS) J2=NV
 1265 READ (7) (PNAME(J),J=J1,J2),(PELMNT(J),J=J1,J2)
C
C     READ RUN DESCRIPTION
C     AND WRITE IT TO TAPE AND PRINTER
C
      NL=0
      WRITE (3) 10HARTILLERY
 1270 CALL LCHPTR(1H ,TIT5,30,DATE,NL,-55)
 1280 READ(5,402) DSCRPT
      IF(EOF(5)) 1300,1290
 1290 IF(DSCRPT(1).EQ.3HDEQ) GO TO 1310
      WRITE(6,403) DSCRPT
      WRITE(3) (DSCRPT(I),I=1,8)
      GO TO 1280
 1300 WRITE(6,404)
      WRITE(6,301) TYPE(3)
      IER=.TRUE.
      GO TO 3000
C
C     ALL OF THE DESCRIPTIONS HAVE BEEN READ IN AND THE DEQ CARD FOUND
C
 1310 WRITE(3) DSCEND,(DSCRPT(J),J=2,8)
      IF(.NOT.TFLG) GO TO 1335
 1315 READ(7) FILE
      IF(EOF(7)) 1335,1320
 1320 IF(TNAME.EQ.5HSPACE) GO TO 1325
      IF((TNAME.NE.6HTITLE1).AND.(TNAME.NE.6HTITLE2)) GO TO 1330
      NL=0
      IF(TNAME.EQ.6HTITLE1)  CALL LCHPTR(1H ,TIT2,30,DATE,NL,-55)
      IF(TNAME.EQ.6HTITLE1) WRITE(6,504)
      WRITE(6,507) (DSC(I),I=1,7)
      GO TO 1315
```

```
 1325 IF(DSC(1).NE.1H ) WRITE(6,505)
      WRITE(6,506) (DSC(I),I=1,7)
      IF(DSC(1).NE.1H ) WRITE(6,505)
      GO TO 1315
 1330 NFB=BN
      NFR=RN
      BN=XCOEF(NFB)
      RN=XCOEF(NFR)
      DECODE(6,500,TCODE) NS(1),NS(2),NS(3)
      DO 1331 I=1,3
      IF((NS(I).GE.0).OR.(NS(I).LT.-2)) GO TO 1331
      BN=1.0-BN
      RN=1.0-RN
 1331 CONTINUE
      WRITE(6,502)TNAME,(NS(I),I=1,3),(DSC(I),I=1,7),BN,NFB,RN,NFR
      GO TO 1315
 1335 CONTINUE
C
C     DECODE THE INTEGRATION PARAMETERS
C
      DECODE(80,103,DSCRPT(1)) TYP,TINC,DELT,ERROR,DTINER,TEND,ALPHA
C         TINC    - MAXIMUM INTEGRATION INTERVAL ALLOWED
C         DELT    - INITIAL INTERVAL DT
C         ERROR   - ERROR PARAMETER SPECIFICATION FOR DEQ
C         DTINER  - DATA POINT INTERVAL
C         TEND    - END OF INTEGRATION TIME
C         ALPHA   - SCALE FACTOR FOR ACQUISITION EQ.S
      NL=0
      CALL LCHPTR (1H ,TIT3,30,DATE,NL,-55)
      WRITE(6,207) TINC,DELT,ERROR,DTINER,TT,TEND,ALPHA
C
C     READ IN THE MODIFY CARDS FOR THIS RUN
C
      NL=0
      TOUTER=TEND
 1650 READ(5,104) CARD
      IF(EOF(5)) 2500,1700
 1700 IF(CARD(1).EQ.TYPE(4)) GO TO 1800
      WRITE (6,302) CARD
      WRITE (6,301) TYPE(4)
      IER=.TRUE.
      GO TO 1650
C     DECODE THE MODIFY CARDAND CHECK FOR TT> GAME START TIME
 1800 DECODE (70,401,CARD(2)) TIME,(INDEX(I),VAL(I),I=1,4)
C         TIME    - TIME AT WHICH CHANGE IS TO TAKE PLACE
C         INDEX   - INDEX OF PARAMETER BEING MODIFIED
C         VAL     - NEW PARAMETER VALUE
      IF(TIME.GT.TT) GO TO 2000
      DO 1860 I=1,4
      IF (INDEX(I).LE.0) GO TO 1860
C
C     MODIFY THE VALUE IN THE COMMON AREA USING THE INDEX NUMBER
C
      K=INDEX(I)
      XCOEF(K)=VAL(I)
      IF(K.GT.1552) X1(K-1552)=VAL(I)
      CALL LCHPTR (1H ,TIT4,30,DATE,NL,-55)
```

```
      IF(NL.EQ.2) WRITE(6,208) TT
      WRITE (6,209) K,XNAME(K),ELEMNT(K),VAL(I)
 1860 CONTINUE
      READ (5,104) CARD
      IF (EOF(5)) 2500,1700
 2000 IF(TIME.GT.TEND) TIME=TEND
      TOUTER=TIME
      GO TO 3000
 2500 TOUTER=TEND
 3000 CONTINUE
      IF (IER) STOP5
      WRITE(3) TITLE,DATE,TINC,DELT,ERROR,DTINER,TOUTER,TT,TEND,ALPHA
      IF(.NOT.BFLG) TT=-TT
C
C     BEGIN THE SIMULATION
C
      CALL ARTMODL(DATE,INDEX,VAL,NXCOEF,NV,TT,SWT2,NDV)
C
  100 FORMAT(A10,5L1,F5.0,6A10)
  103 FORMAT(A10,6F10.0)
  104 FORMAT (8A10)
  150 FORMAT(//10H ERROR ***, *MODEL TYPE NOT RECOGNIZED: *,A10,
     1* EXPECTED TYPE - ARTILLERY*)
  201 FORMAT(///10X,*READ FLAG = *,L3///10X,*OUTPUT FLAG = *,L3///10X,
     1*TIME RECORD FLAG = *,L3///10X,*INPUT TABLES FLAG = *,L3///,10X,
     1*GAME RESTART FLAG = *,L3///)
  202 FORMAT (///10X,*INPUT DATA SET TITLE = *,6A10,///10X,*INPUT DATA
     1ET DATE = *,A10)
  203 FORMAT (/19X,7(I7,8X))
  204 FORMAT (22X,7(A10,5X))
  205 FORMAT (1H0,17X,7(E13.6,2X))
  206 FORMAT (  5X,*XCOEF*,I5,7(5X,10(1H-)),/6X,7(13X,I2))
  207 FORMAT (///10X,*TINC =  *,F10.5,//10X,*DELT =  *,F10.5,//10X,
     1   *ERROR = *,F10.5,//10X,*DTINER =*,F10.5,//10X,
     *   *TSTART =*,F10.5//10X,
     2   *TEND =  *,F10.5//10X,*ALPHA = *,F10.5)
  208 FORMAT (//* PARAMETERS MODIFIED AT TIME = *,F10.5//)
  209 FORMAT(10X,*XCOEF(*,I4,*) = *,2A10,* = *E15.6)
  210 FORMAT (20X,7(A10,5X))
  300 FORMAT(15X,A10,5L1,3X,F5.0,8X,6A10)
  301 FORMAT(//1X,5H*****,* ABOVE CARD MISPLACED OR UNIDENTIFIABLE*,
     1   5X,*EXPECTED CARD TYPE *,A10)
  302 FORMAT (//5X,8A10)
  401 FORMAT (F10.0,4(I5,F10.0))
  402 FORMAT(8A10)
  403 FORMAT(21X,8A10)
  404 FORMAT(1H1//3X,15H* END OF FILE *)
  500 FORMAT(3I2)
  502 FORMAT(1X,A6,3I3,3X,7A10,2X,F12.4,*(*,I4,*)I*,F12.4,*(*,I4,*)*)
  504 FORMAT(1X/95X,*BLUE*,14X,*RED*)
  505 FORMAT(109X,*I*)
  506 FORMAT(19X,7A10,20X,*I*)
  507 FORMAT(1X/21X,7A10/1X,13(10H..........))
      END
```

```
      SUBROUTINE AIRMODL(DATE,INDEX,VAL,NXC,NV,TIME,NDV)
C          AIRMODL IS THE MODELING ROUTINE FOR THE AIR VERSION OF THE
C     COMBAT II SYSTEM. IT IS CALLED BY AIRINPT,WHICH SETS UP THE
C     INITIAL STATES, FLOW PARAMETERS, AND COEFFICIENTS OF THE
C     DEPENDENCIES AMONG THE VARIABLES. THE SIMULATION IS A DOUBLE LOOP
C     THE OUTER LOOP WRITES THE VALUES OF ALL QUANTITY AND FLOW
C     VARIABLES TO TAPE AT USER-SPECIFIED TIME INTERVALS.  THE INNER
C     LOOP IS THE INTEGRATION LOOP: IT TIME-STEPS THROUGH THE INTERVAL,
C     CALLING INTEG TO INTEGRATE A SYSTEM OF ORDINARY DIFFERENTIAL
C     EQUATIONS (THE FLOWS AND ATTRITION RATES), THEN SETTING THE
C     VALUES OF ALL THE QUANTITY VARIABLES DEPENDENT ON THE INTEGRATED
C     VARIABLES.  THE INNER LOOP JUMPS OUT TO THE OUTER LOOP EACH TIME
C     ONE OF THE WRITE TIME INTERVALS IS REACHED.
C          THERE ARE SIX MAJOR SETS OF EQUATIONS: THOSE DEALING WITH
C     AIR-TO-AIR COMBAT, GROUND DEFENST AGAINST AIR ATTACK, MISSILE
C     AND AIRCRAFT ATTACKS ON GROUND TARGETS, GROUNT-TO-GROUND INTER-
C     ACTIONS, FLOWS AND ATTRITIONS, AND THE KINEMATICS OF THE MOVE-
C     MENTS OF FORCES, FRONTS, AND SUPPLIES.
C
      COMMON /XCOEF/ C0010X(2),C0020X(2),C0030X(2),C0040X(2),C0050X(2,
     12),C0211X(3,2),C0212X(3,2),C0213X(3,2),C0214X(3,2),C0215X(3,2,2),
     2C0231X(2,2),C0232X(2,2),C0233X(2,2),C0234X(2,2),C0235X(2,2,2),
     3C0242X(2),C0243X(2),C0244X(2),C0245X(2),C0251X(2),C0252X(2),C0253X
     4(2),C0254X(2),C0255X(2,2),C0261X(2),C0262X(2),C0263X(2),C0264X(2),
     5C0265X(2,2),C0307X(2,2,2),C0406X(2),C0407X(2),C0511X(2),C0512X(2,2
     6),C0513X(2,2),C0521X(2),C0522X(2),C0551X(2),C0552X(2),C0601X,C0603
     7X(3,2),C0604X(2),C0605X(2),C0606X(2),C0607X(2),C0610X(2),C0611X(2)
     *,C0613X(2),C0614X(2),E0511X(2),E0512X(3,2,2),                    E
     *0521X(2),F0001X(3,2),F0101X(3,2),F0102X(2),F0103X(2),F0104X(3,2),
     8F0105X(3,2),F0106X(3,2),F0107X(3,2,2),F0108X(3,2,2),F0109X(2),
     9F0201X(3,3,2),F0202X(3,3,2),F0301X
     *    (2,2),F0302X(2,3,2),F0303X(2,3,2),F0304X(2,2),F0305X(2,2),F0306
     1    X(2,2,2),F0307X(2,2),F0308X(2,2,2),F0401X(3,2),
     2F0402X(3,2),F0601X(3,2),P0001X(3,3,2),P0002X(3,3,2),P0003X(3,3,2),
     3P0004X(3,3,2),P0101X(3,2,2),P0102X(3,2,2),P0103X(3,2),P0104X(3,2),
     4P0105X(3,2), P0107X(3,2),P0108X(2,3,2),P0109X(2,3,2),P0301X(2,2),P
     50302X(2,2),P0303X(2,2),P0304X(2,2),P0305X(2,2,2),P0306X(2,2),P0307
     6X(2,2,2),P0323X(3,2,2),P0324X(3,2,2),P0325X(3,2,2),P0326X(3,2,4),
     7 P0327X(3,2,4),P0401X(2),P0402X(2),P0403X(2),P0404X(2),P0405X(2)
      COMMON /XCOEF/ R0001X(2,3,2),R0301X(2,2),R0401X(2),R0402X(2),
     1R0571X(2,3,2),R0572X(2,2,2),R0574X(2),R0575X(2),R0576X(2),R0577X(
     2    2),R0578X(2,2),R0579X(2,2),R0601X,R0602X(2),R0603X(2),R0604X(2)
     3,R0605X(2),R0700X(2,2),V0541X(2,2),V0545X(2,2),V0551X(2),
     4    V0552X(2),V0601X(3,2),V0(38,2)
      COMMON /PV/ V(38,2),AV(10,2),VA(702),C0001P(3,3,2),C0002P(3,3,2),
     1    C0003P(2,2),C0601P(3,2),D0601P(3,2),
     1 D0602P(3,2),D0603P(3,2),D0604P(3,2),
     2F0101P(3,3,2),F0103P(3,3,2),
     1    F0105P(3,3,2),F0106P(3,2),F0107P(3,2),F0108P(3,2),F0109P(3,2,
     22),F0110P(3,2,2),F0301P(2,3,2),F0302P(2,3,2),F03
     2    03P(2,2),F0304P(2,2),F0305P(2,2,2),F0306P(2,2),F0307P(2,2,2),
     *    F0321P(2,3,2),F0322P(2,3,2),F0323P(3,2,2),
     3    P0101P(3,3,2),P0102P(3,3,2),P0103P(3,3,2),P0104P(3,3,2),P0105P(
     4    3,2),P0106P(3,2),P0108P(3,2),P0110P(3,2,2)
     *,P0301P(2,3,2),P0302P(2,3,2),P0303P(2,2),P0304P(2,2),P0305P(2,2,2)
     *                ,P0402P(3,2),P0403P(3,2),P0404P(3,2),P0405P(3,2)
     5   ,V0301P(2,2),V0401P(3,2),V0402P(3,2),V0541P(2,2),V0542P(2,2),
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6    V0545P(2,2),V0601P(3,2)
      COMMON /PDV/ DV(38,2),DAV(10,2),A0001P(3,2),A0002P(3,2),
     1A0101P(3,3,2),A0102P(3,3,2),A0103P(3,2),A0104P(3,2),A0105P(3,2),
     2    A0106P(2,3,2),A0107P(2,3,2),A0301P(2,3,2),A0302P(2,3,2),A0303P(
     3    2,2),A0304P(2,2),A0305P(2,2,2),A0306P(2,  2),A0307P(2,3,2),A030
     4    8P(2,3,2),A0321P(3,3,2),A0322P(3,3,2),A0323P(3,2),A0324P(3,2),
     5    A0325P(3,2),A0326P(3,2,2),A0327P(3,3,2),A0328P(3,3,2),A0401P(
     6    3,2),A0402P(3,2),A0403P(3,2),A0404P(3,2),A0405P(3,2),A0501P(3,2
     7),A0511P(3,2),A0512P(3,2),A0513P(2,3,2),A0514P(3,2),A0515P(2,2),A0
     8516P(2,2),A0517P(2,3,2),A0521P(3,2),A0522P(3,2),A0531P(2),A0532P(2
     9),A0533P(2),A0540P(2),A0541P(2,2),A0542P(2,2),A0543P(2,2),A0544P(2
     *,2),A0551P(3,2),A0552P(3,2),A0561P(2),A0562P(2),A0563P(2),A0564P(2
     1),E0511P(2,2),E0512P(2,2),E0521P(3,2),E0551P(3,2),E0552P(3,2),R000
     21P(3,2,2),R0002P(3,2),R0003P(3,2),R0004P(3,2),R0005P(2),R0006P(3
     3,2,2),R0007P(3,2,2),R0301P(2,3,2),R0302P(2,3,2),R0303P(2,2),R0304P
     4(2,2),R0305P(2,2,2),R0306P(2,2),R0307P(2,2,2),R0321P(3,3,2),R0322P
     5(3,3,2),R0323P(3,2),R0324P(3,2),R0325P(3,2),R0326P(3,2,2),R0327P(3
     6,2,2),R0401P(3,2),R0402P(3,2),R0403P(3,2),R0404P(3,2),R0541P(2,2),
     7R0571P(2,3,2),R0572P(2,2,2),R0574P(2),R0575P(2),R0576P(2),R0577P(2
     8),R0578P(2,2),R0579P(2,2),R0601P(3,2),R0602P(3,2),R0603P(3,2),R060
     94P(3,2)
      COMMON /XINTEG/ TINC,DELT,ERROR,DTINER,TOUTER,TEND,CARD(8),ALPHA
      COMMON/DICT/PNAME(1275),PELMNT(1275),SWT3,QX1,GX2
      COMMON/DICT2/ XNAME(792),ELEMNT(792)
      DIMENSION INDEX(4),VAL(4),PV(1)
      DIMENSION XCOEF(1),PDV(1),TIT4(3)
      DIMENSION DISG2(4,2)
      EQUIVALENCE (XCOEF(1),C0010X(1)),(PDV(1),DV(1,1)), (PV(1), V(1,1))
      INTEGER PAJ,PA4,PA5,PG1F,PG2F,PG1R,PG2R,PM,PL,PB,PG5F,PG6F,PG5R,PG
     16R,PXF,PS,PSB
      LOGICAL MODFLG
      DATA PG1F/0/,PG1R/4/,PL/4/,PG2F/6/,PG2R/10/,PM/10/,PS/13/,PB/13/,
     1    PSB/15/,PAJ/17/,PA4/23/,PA5/25/,PG5F/27/,PG5R/31/,PG6F/31/,
     2    PG6R/35/,PXF/35/
C
C  THE VARIABLES SET IN THE ABOVE DATA STATEMENT ARE USED TO DERIVE THE
C  INDICES IN THE ARRAYS V AND V0 FOR THE DIFFERENT ENTITIES KEPT TRACK
C  OF BY COMBAT-II.  FOR EXAMPLE, PAJ+(2J+M)-2 IS THE INDEX FOR THE
C  AIRCRAFT OF TYPE J AT BASE M, AND V(PAJ+(2J+M)-2,I) IS THE NUMBER OF
C  AIRCRAFT OF TYPE J AT BASE M FOR SIDE I.  THE MEANINGS OF THE OTHER
C  INDICES ARE AS FOLLOWS
C        PG1F+I      - GROUND FORCES IN FRONT I
C        PG1R        - GROUND FORCES IN THE REAR
C        PL+M        - LAUNCHERS FOR MISSILES OF TYPE M
C        PG2F+I      - SUPPLIES IN FRONT I
C        PG2R        - SUPPLIES IN THE REAR
C        PM+M        - MISSILES OF TYPE M
C        PS          - NUCLEAR STORAGE SITES
C        PB+K        - AIRBASES OF TYPE K
C        PSB+K       - REPAIR STATUS AT AIR BASE K
C        PA4+M       - CONVENTIONAL AIRCRAFT LOADS AT BASE M
C        PA5+M       - NUCLEAR AIRCRAFT LOADS AT BASE M
C        PXF+I       - COORDINATE OF THE FEBA IN FRONT I
C        PG5F+I      - NUMBER OF ROUNDS FOR G3'S IN FRONT I
C
      DATA JA/3/,IF/3/,LL/2/,MB/2/
C  THE VARIABLES SET IN THE ABOVE DATA STATEMENT ARE THE LIMITS OF DO
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```
C   LOOPS, AND HAVE THE FOLLOWING MEANINGS
C         JA    -  NUMBER OF AIRCRAFT TYPES
C         IF    -  NUMBER OF FRONTS
C         LL    -  NUMBER OF MISSILE TYPES
C         MB    -  NUMBER OF AIR BASE TYPES
C
C   THE FOLLOWING VARIABLES ALSO OCCUR IN THIS SUBROUTINE
C         SWT2(I)        - REAL FLAG CONTAINING THE VALUE 1 OR 2.
C                          SWT2(I)=1 INDICATES THAT SIDE I IS FLYING
C                          NUCLEAR WEAPONRY
C         SWT3           - LOGICAL FLAG CAUSES INTEGRATION SUMMARY TO
C                          BE PRINTED
C         NDEQ           - COUNTER FOR THE NUMBER OF INTEGRATION STEPS
C                          PERFORMED SINCE THE LAST TIME HISTORY OUTPUT
C         XKJ            - VALUE OF THE CPU CLOCK
C         ALPHA          - OVERALL TARGET ACQUISITION ADJUSTMENT FACTOR
C         IB,IR          - INTEGER FLAG HOLDING EITHER 1 OR 2.  USED TO
C                          DEFINE WHICH PLAYER'S VALUES ARE BEING USED.
C                          IB =3-IR
C         TOUT           - TIME OF THE NEXT ENTRY TO THE TIME HISTORY FILE
C         TOUTER         - TIME OF THE NEXT USER MODIFICATION OF THE DATA
C                          BASE
C         DTINER         - TIME STEP TO THE NEXT TOUT
C         TEND           - MODEL RUN END TIME
C
      DATA NORDER/798/,NCOMOD/38/
      DATA TYPE  /10HMODIFY     /
      DATA TIT4/10HMODIFIED C,10HOEFFICIENT,10H VALUES    /
C
      PRINT 1
    1 FORMAT(1H-)
      IF(TIME.GT.0.0) GO TO 1260
      TIME=ABS(TIME)
C     INITIALIZE STATE VECTOR
      DO 1200 I=1,2
      DO 1100 J=1,NCOMOD
      V(J,I) = VO(J,I)
 1100 CONTINUE
      IR=I
      IB=3-IR
C     SETUP OF NA POOL
      AV(PG1F+1,IB)=V(PG1F+1,IR)*C0010X(IB)
      AV(PG1F+2,IB)=V(PG1F+2,IR)*C0010X(IB)
      AV(PG1F+3,IB)=V(PG1F+3,IR)*C0010X(IB)
      AV(PG2F+1,IB)=V(PG2F+1,IR)*C0020X(IB)
      AV(PG2F+2,IB)=V(PG2F+2,IR)*C0020X(IB)
      AV(PG2F+3,IB)=V(PG2F+3,IR)*C0020X(IB)
      AV(PG1R,IB)=V(PG1R,IR)*C0030X(IB)
      AV(PG2R,IB)=V(PG2R,IR)*C0040X(IB)
      AV(PL+1,IB)=V(PL+1,IR)*C0050X(1,IB)
      AV(PL+2,IB)=V(PL+2,IR)*C0050X(2,IB)
 1200 CONTINUE
      DO 1250 I=1,NDV
 1250 PDV(I)=0.0
 1260 CONTINUE
C     WRITE OUT THE INITIAL DATA POINT TO THE OUTPUT TAPE
      WRITE(3) TIME,(XCOEF(I),I=1,NXC),(PV(I),I=1,NV),(PDV(I),I=1,NDV)
```

```
      H=TIME
      TOUT=DTINER
 3000 CONTINUE
C
C     OUTER LOOP PROCESSING BEGINS
C
C     INTEGRATION LOOP
      TLIM = AMIN1(TINC,DTINER/2.0)
      DT = DELT
      JUMP = -1
 4000 CONTINUE
C
C     INNER LOOP PROCESSING BEGINS
C
      IF((V(PG1F+1,1)+V(PG1F+2,1)+V(PG1F+3,1).LE.6.0).OR.(V(PG1F+1,2)+
     1   V(PG1F+2,2)+V(PG1F+3,2).LE.6.0)) STOP5
      DTINER2=AMIN1(TOUTER,TOUT)-TIME
      IF(DTINER2.LT.DELT) DTINER2=DELT
      CALL SECOND(XKJ)
      IF(SWT3.EQ.1) WRITE(6,1945) TIME,TOUTER,TOUT,XKJ,NDEQ
      TIME=TIME+DTINER2
 1945 FORMAT(6X,5HTIME=,F8.2,5X,12HNEXT CHANGE=,F8.2,5X,
     1   16HNEXT DATA POINT=,F8.2/11X,10HCPU TOTAL=,F8.4,5X,
     2   22HDEQS IN LAST INTERVAL=,I5/)
      NDEQ=0
 4100 CONTINUE
      NDEQ=NDEQ+1
      EMAX = ERROR
      EMIN = EMAX/100.
      CONV = EMIN/100.
C
C     PERFORM THE INTEGRATION
C
      CALL INTEG(DV,H,TIME,TLIM,V,EMAX,EMIN,NORDER,DT,CONV,JUMP)
C     RESTRICT COMMODITIES TO NON-NEGATIVE VALUES
      DO 5015 J=1,2
      IF(V0(PG1F+1,J)+V0(PG1F+2,J)+V0(PG1F+3,J)+V0(PG1R,J)+R0574X(J).LT.
     1   .01) V(PG1F+1,J)=V(PG1F+2,J)=V(PG1F+3,J)=V(PG1R,J)=0.0
      IF(V0(PG2F+1,J)+V0(PG2F+2,J)+V0(PG2F+3,J)+V0(PG2R,J)+R0575X(J).LT.
     1   .01) V(PG2F+1,J)=V(PG2F+2,J)=V(PG2F+3,J)=V(PG2R,J)=0.0
      IF(V0(PG5F+1,J)+V0(PG5F+2,J)+V0(PG5F+3,J)+V0(PG5R,J)+R0576X(J).LT.
     1   .01) V(PG5F+1,J)=V(PG5F+2,J)=V(PG5F+3,J)=V(PG5R,J)=0.0
      IF(V0(PG6F+1,J)+V0(PG6F+2,J)+V0(PG6F+3,J)+V0(PG6R,J)+R0577X(J).LT.
     1   .01) V(PG6F+1,J)=V(PG6F+2,J)=V(PG6F+3,J)=V(PG6R,J)=0.0
      DO 4051 M=1,2
      IF(V0(PM+M,J)+R0578X(M,J).LT..01) V(PM+M,J)=0.0
      IF(V0(PL+M,J)+R0579X(M,J).LT..01) V(PL+M,J)=0.0
      DO 4052 I=1,3
      IF(V0(PAJ-2+2*I+M,J)+R0571X(M,I,J).LT..01) V(PAJ-2+2*I+M,J)=0.0
 4052 CONTINUE
      IF(V0(PA4+M,J)+R0572X(M,2,J).LT..01) V(PA4+M,J)=0.0
      IF(V0(PA5+M,J)+R0572X(M,1,J).LT..01) V(PA5+M,J)=0.0
 4051 CONTINUE
      DO 5005 I=1,10
 5005 IF(AV(I,J).LT.0.0) AV(I,J)=0.0
      DO 5015 I=1,35
 5015 IF(V(I,J).LT.0.0) V(I,J)=0.0
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      IF(JUMP) 6000,5000,7000
 5000 CONTINUE
C     CALCULATE COEFFICIENTS AND KINEMATIC EQUATIONS
      DO 5040 IB=1,2
      IR=3-IB
C**********************************************************************
C     FIRST EQUATION SET
C
C     AA(I) VERSUS AA(J)
C
C     SB(M) MOVEMENT
C EQN (1-1) - SB(M) KINEMATIC
      DO 5017 M=1,MB
      DV(PSB+M,IB)=DIVIDE(((R0307P(1,M,IR)+R0307P(2,M,IR))*C0307X(M,1,IR
     1   )+R0327P(1,M,IR)*SQRT(1.0-P0105P(1,IB))*SQRT(1.0-P0109X(M,1,IB)
     2   )*C0307X(M,2,IR)+ R0327P(2,M,IR)*SQRT(1.0-P0105P(2,IB))*SQRT(
     3   1.0-P0109X(M,2, IR))*(F0323P(2,1,IR)*C0307X(M,1,IR)+F0323P(2,2,
     4   IR)*C0307X(M,2,IR))+ R0327P(3,M,IR)*SQRT(1.0-P0105P(3,IB))*
     5   SQRT(1.0-P0109X(M,3,IB))*(F0323P(3,1,IR)*C0307X(M,1,IR)+
     6   F0323P(3,2,IR)*C0307X(M,2,IR))),V(PB+M,IB))-R0700X(M,IB)*
     7   SWITCH(V(PSB+M,IB))
C EQN (1-1A) - DEGRADATION FACTOR AT B(M)
      C0003P(M,IB)=EXP(-V(PSB+M,IB))
 5017 CONTINUE
C EQN (1-1C) - LAUNCH A1
      DO 5020 M=1,MB
      R0006P(1,M,IB)=R0001X(M,1,IB)*V(PAJ+M,IB)*C0003P(M,IB)*SWITCH(
     1   V(PA4+M,IB))
      R0007P(1,M,IB)=0.0
C EQN (1-1D) - LAUNCH A2 AND A3
      DO 5020 J=2,JA
      JM=2*J+M-2
      Q=R0001X(M,J,IB)*V(PAJ+JM,IB)*C0003P(M,IB)
      R0007P(J,M,IB)=F0001X(J,IB)*Q*(1.0-EXP(-.15*V(PA5+M,IB)))
      R0006P(J,M,IB)=AMIN1(Q-R0007P(J,M,IB),Q*SWITCH(V(PA4+M,IB)))
 5020 CONTINUE
      DO 5030 I=1,JA
      DO 5025 M=1,MB
C EQN (1-2A) - A(I) LAUNCH RATE
      R0001P(I,M,IB)=R0006P(I,M,IB)+R0007P(I,M,IB)
 5025 CONTINUE
C EQN (1-3) - A(I)G LAUNCH RATE
      R0003P(I,IB)=F0001X(I,IB)*(R0001P(I,1,IB)+R0001P(I,2,IB))
C EQN (1-2B) - A(I)A LAUNCH RATE
      R0002P(I,IB)=R0001P(I,1,IB)+R0001P(I,2,IB)-R0003P(I,IB)
      DO 5027 M=1,MB
C (1-3B) - A(I)G FROM B(M)
      F0322P(M,I,IB)=F0001X(I,IB)*DIVIDE(R0001P(I,M,IB),R0003P(I,IB))
C EQN (1-3A) - A(I)A FROM B(M)
      F0321P(M,I,IB)=(1.0-F0001X(I,IB))*DIVIDE(R0001P(I,M,IB),
     1   R0002P(I,IB))
 5027 CONTINUE
C EQN (1-3C) - A(J)G CARRYING A(M)
      F0323P(I,1,IB)=DIVIDE(R0007P(I,1,IB)+R0007P(I,2,IB),R0003P(I,IB))
      F0323P(I,2,IB)=1.0-F0323P(I,1,IB)
 5030 CONTINUE
C EQN (1-4) - TOTAL LAUNCH RATE FOR ALL AIRCRAFT
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      R0005P(IB)=R0001P(1,1,IB)+R0001P(2,1,IB)+R0001P(3,1,IB)+
     1               R0001P(1,2,IB)+R0001P(2,2,IB)+R0001P(3,2,IB)
 5040 CONTINUE
      DO 5120 IB=1,2
      IR=3-IB
      DO 5100 J=1,JA
      DO 5060 I=1,JA
C EQN (1-5) SINGLE SHOT MISS PROBABILITY FOR AA(I) VS. AA(J)
      C0001P(I,J,IB) = 1.0-P0001X(I,J,IR)*P0002X(I,J,IR)
 5060 CONTINUE
C EQN (1-6) - DIRECT ATTRITION FOR AA VS. AA(J)
      A0001P(J,IB) = R0002P(J,IB)*(1.0-C0001P(1,J,IB)**DIVIDE(R0002P(1,I
     $                R),R0005P(IB))*C0001P(2,J,IB)**DIVIDE(R0002P(2,IR),
     $                R0005P(IB))*C0001P(3,J,IB)**DIVIDE(R0002P(3,IR),R00
     $                05P(IB)))
C
C     AA(I) VS. AG(J)
      DO 5080 I=1,JA
C EQN (1-7) - SINGLE SHOT MISS PROBABILITY FOR AA(I) VS. AG(J)
      C0002P(I,J,IB) = 1.0-P0003X(I,J,IR)*P0004X(I,J,IR)
 5080 CONTINUE
C EQN(1-8) - ATTRITION OF AA VS. AG(J)
      A0002P(J,IB)=R0003P(J,IB)*(1.0-C0002P(1,J,IB)**DIVIDE(R0002P(1,IR)
     1 ,R0005P(IB))*C0002P(2,J,IB)**DIVIDE(R0002P(2,IR),R0005P(IB))
     2 *C0002P(3,J,IB)**DIVIDE(R0002P(3,IR),R0005P(IB)))
C EQN (1-9) - SURVIVAL RATE FOR AG(J)
      R0004P(J,IB) = R0003P(J,IB)-A0002P(J,IB)
 5100 CONTINUE
 5120 CONTINUE
      DO 5220 IB=1,2
      IR=3-IB
      DO 5200 J=1,JA
      DO 5140 I=1,IF
C
C************************************************************************
C     SECOND EQUATION SET
C     GROUND DEFENSES AGAINST AG(J)
C
C     G1F DEFENSE
C EQN (2-1) - FRACTIONAL ALLOCATION OF AF(J) TO FRONT I
      F0101P(J,I,IB)=DIVIDE(A0401P(I,IB),(A0401P(1,IB)+A0401P(2,IB)+
     1 A0401P(3,IB)))
C EQN (2-2) - ACQUISITION FACTOR FOR AG(J) VS. G1F(I)
      P0101P(J,I,IB)=1.0-EXP(-ALPHA*C0211X(J,IB)*AV(PG1F+I,IB))
C EQN (2-3) - ACQUISITION FACTOR FOR AG(J) VS. G2F(I)
      DISG2(I,IR)=DIVIDE(AMAX1 (V(PG2F+I,IR)-C0521X(IR)*V(PG1F+I,IR),
     1   0.0),V(PG2F+I,IR))
      P0102P(J,I,IB)=1.0-EXP(-ALPHA*C0211X(J,IB)*DISG2(I,IR)*AV(PG2F+I,
     1   IB))
C EQN (2-5) - FRACTIONAL ALLOCATION OF AIR BATTLE SURVIVORS TO G1F(I)
      F0103P(J,I,IB)=F0101X(J,IB)*F0101P(J,I,IB)*F0201X(J,I,IB)
C EQN (2-6) - KILL PROBABILITY FOR G1F(I) AD AGAINST AG(J)
      P0103P(I,J,IR) = 1.0-(1.0-P0103X(J,IR))**(F0102X(IR)*V(PG1F+I,IR))
C EQN (2-7) - DIRECT ATTRITION FOR G1F(I) VS. AG(J)
      A0101P(I,J,IB) = R0004P(J,IB)*F0103P(J,I,IB)*(1.0-(1.0-P0103P(I,J,
     $                IR))*(1.0-P0101P(J,I,IB)*P0104X(J,IR)))
C
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C      G2F DEFENSE
C
C EQN (2-9) - FRACTIONAL ALLOCATION OF AIR BATTLE SURVIVORS TO G2F(I)
      F0105P(J,I,IB)=F0101X(J,IB)*F0101P(J,I,IB)*F0202X(J,I,IB)
C EQN (2-10) - KILL PROBABILITY FOR G2F(I) AD AGAINST AG(J)
      P0104P(I,J,IB) = 1.0-(1.0-P0103X(J,IB))**(F0103X(IB)*V(PG2F+I,IB))
C EQN (2-11) - DIRECT ATTRITION  FOR G2FI ON AF(J)
      A0102P(I,J,IB) = R0004P(J,IB)*F0105P(J,I,IB)*(1.0-(1.0-P0104P(I,J,
     1   IB))*(1.0-P0102P(J,I,IB)*P0105X(J,IB)))
 5140 CONTINUE
C
C      G1R DEFENSE
C
C EQN (2-12) - KILL PROBABILITY FOR REAR AGAINST AG(J)
      P0105P(J,IB) = 1.0-(1.0-P0103X(J,IB))**(F0109X(IB)*(V(PG1F+1,IB)+V
     $                (PG1F+2,IB)+V(PG1F+3,IB))/3.)
C EQN (2-13) - FRACTIONAL ALLOCATION OF AIR BATTLE SURVIVORS TO G1R
      F0106P(J,IB)= (1.0-F0101X(J,IB))*F0104X(J,IB)
C EQN (2-14) - ACQUISITION FACTOR FOR AGR(J)  AGAINST G1
      P0108P(J,IB)=1.0-EXP(-ALPHA*C0214X(J,IB)*AV(PG2R,IB))
C EQN (2-15) - DIRECT ATTRITION FOR G1R AGAINST AG(J)
      A0103P(J,IB) = R0004P(J,IB)*F0106P(J,IB)*(1.0-(1.0-P0105P(J,IB))*(
     $                1.0-P0106P(J,IB)*P0104X(J,IB)))
C
C      G2R DEFENSE
C
C (2-16) FRACTIONAL ALLOCATION OF AIR BATTLE SURVIVORS TO G2R
      F0107P(J,IB) = (1.0-F0101X(J,IB))*F0105X(J,IB)
C EQN (2-17) - ACQUISITION FACTOR OF AG(J) AGAINST G2R
      DISG2(4,IB)=DIVIDE(AMAX1(V(PG2R,IB)-C0521X(IB)*V(PG1R,IB),0.0),
     1   V(PG2R,IB))
      P0106P(J,IB)=1.0-EXP(-ALPHA*C0213X(J,IB)*DISG2(4,IB)*AV(PG2R,IB))
C EQN (2-18) - DIRECT ATTRITION FOR G2R AGAINST AG(J)
      A0104P(J,IB) = R0004P(J,IB)*F0107P(J,IB)*(1.0-(1.0-P0105P(J,IB))*(
     $                1.0-P0108P(J,IB)*P0105X(J,IB)))
C
C      S DEFENSE
C EQN(2-19) - FRACTIONAL ALLOCATION OF AIR BATTLE SURVIVORS TO S
      F0108P(J,IB) = (1.0-F0101X(J,IB))*F0106X(J,IB)
C EQN (2-21) DIRECT ATTRITION FOR S AGAINST AG(J)
      A0105P(J,IB) = R0004P(J,IB)*F0108P(J,IB)*(1.0-(1.0-P0105P(J,IB))
     1*(1.0-P0107X(J,IB)))
C
C      LAUNCHER DEFENSE
      DO 5160 L=1,LL
C EQN (2-22) - FRACTIONAL ALLOCATION OF AIR BATTLE SURVIVORS TO L(L)
      F0109P(J,L,IB) = (1.0-F0101X(J,IB))*F0107X(J,L,IB)
C EQN (2-23) - ACQUISITION FACTOR FOR AG(J) AGAINST L(L)
      P0110P(J,L,IB)=1.0-EXP(-ALPHA*C0215X(J,L,IB)*AV(PL+L,IB))
C EQN (2-24) - DIRECT ATTRITION FOR L(L) AGAINST AG(J)
      A0106P(L,J,IB) = R0004P(J,IB)*F0109P(J,L,IB)*(1.0-(1.0-P0105P(J,IB
     $                ))*(1.0-P0110P(J,L,IB)*P0108X(L,J,IB)))
 5160 CONTINUE
      DO 5180 M=1,MB
C
C      BASE AIR DEFENSES
C EQN (2-25) - FRACTIONAL ALLOCATION OF AIR BATTLE SURVIVORS TO B(M)
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      F0110P(J,M,IB) = (1.0-F0101X(J,IB))*F0108X(J,M,IB)
C EQN (2-26) - DIRECT ATTRITION FOR B(M) AGAINST AG(J)
      A0107P(M,J,IB) = R0004P(J,IB)*F0110P(J,M,IB)*(1.0-(1.0-P0105P(J,IR
     1))*(1.0-P0109X(M,J,IR)))
 5180 CONTINUE
 5200 CONTINUE
 5220 CONTINUE
      DO 5420 IB=1,2
      IR=3-IB
      DO 5320 L=1,LL
C**********************************************************************
C     3A EQUATION SET
C     MISSILES VS. GROUND TARGETS
      DO 5240 I=1,IF
C
C     G1F GROUND TARGETS
C EQN (3-1) - FRACTIONAL ALLOCATION OF L(L) AGAINST G1F(I)
      F0301P(L,I,IR)=F0301X(L,IR)*F0302X(L,I,IR)
     1*F0303X(L,I,IR)
C EQN (3-2) - FLOW OF M(L) FROM REAR TO G1F(I)
      P0301P(L,I,IR)=1.0-EXP(-ALPHA*C0231X(L,IR)*AV(PG1F+I,IR))
      R0301P(L,I,IR)=V(PL+L,IR)*R0301X(L,IR)*F0301P(L,I,IR)*
     1    SWITCH(V(PM+L,IR))*P0301P(L,I,IR)
C EQN (3-3) - ATTRITION FOR M(L) AGAINST G1F(I)
      A0301P(L,I,IB)= P0301X(L,IR)*R0301P(L,I,IR)
C
C     G2F GROUND TARGETS
C EQN (3-4) - FRACTIONAL ALLOCATION OF L(L) AGAINST G2F(I)
      F0302P(L,I,IR)=F0301X(L,IR)*F0302X(L,I,IR)
     1*(1.0-F0303X(L,I,IR))
C EQN (3-5) - FLOW OF M(L) FROM REAR TO G2F(I)
      P0302P(L,I,IR)=1.0-EXP(-ALPHA*C0232X(L,IR)*DISG2(I,IB)*AV(PG2F+I,
     1    IR))
      R0302P(L,I,IR)=V(PL+L,IR)*R0301X(L,IR)*F0302P(L,I,IR)*
     1    SWITCH(V(PM+L,IR))*P0302P(L,I,IR)
C EQN (3-6) - ATTRITION FOR M(L) AGAINST G2F(I)
      A0302P(L,I,IB)= P0302X(L,IR)*R0302P(L,I,IR)
 5240 CONTINUE
C
C     G1R GROUND TARGETS
C EQN (3-7) - FRACTIONAL ALLOCATION OF L(L) TO G1R
      F0303P(L,IR)= (1.0-F0301X(L,IR))*F0304X(L,IR)
C EQN (3-8) - FLOW OF M(L) FROM REAR TO G1R
      P0303P(L,IR)=1.0-EXP(-ALPHA*C0233X(L,IR)*AV(PG1R,IR))
      R0303P(L,IR)=V(PL+L,IR)*R0301X(L,IR)*F0303P(L,IR)*
     1    SWITCH(V(PM+L,IR))*P0303P(L,IR)
C EQN (3-9) - ATTRITION OF M(L) AGAINST G1R
      A0303P(L,IB)=P0303X(L,IR)*R0303P(L,IR)
C
C     G2R GROUND TARGETS
C EQN (3-10) - FRACTIONAL ALLOCATION OF L(L) TO G2R
      F0304P(L,IR)= (1.0-F0301X(L,IR))*F0305X(L,IR)
C EQN (3-11) - FLOW OF M(L) FROM REAR TO G2R
      P0304P(L,IR)=1.0-EXP(-ALPHA*C0234X(L,IR)*DISG2(4,IB)*AV(PG2R,IR)).
      R0304P(L,IR)=V(PL+L,IR)*R0301X(L,IR)*F0303P(L,IR)*
     1    SWITCH(V(PM+L,IR))*P0304P(L,IR)
C EQN (3-12) - ATTRITION OF M(L) AGAINST G2R
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      A0304P(L,IB)= P0304X(L,IR)*R0304P(L,IR)
      DO 5260 K=1,LL
C
C     L(K) GROUND TARGETS
C EQN (3-13) - FRACTIONAL ALLOCATION OF M(L) AGAINST L(K)
      F0305P(L,K,IR)=(1.0-F0301X(L,IR))
     1*F0306X(L,K,IR)
C EQN (3-14) - FLOW OF M(L) FROM REAR TO L(K)
      P0305P(L,K,IR)=1.0-EXP(-ALPHA*C0235X(L,K,IR)*AV(PL+K,IR))
      R0305P(L,K,IR)=V(PL+K,IR)*R0301X(L,IR)*F0305P(L,K,IR)*
     1   SWITCH(V(PM+L,IR))*P0305P(L,K,IR)
C EQN (3-15) - ATTRITION OF M(L) AGAINST L(K)
      A0305P(L,K,IB)= P0305X(L,K,IR)*R0305P(L,K,IR)
 5260 CONTINUE
C
C     S GROUND TARGETS
C EQN (3-16) - FRACTIONAL ALLOCATION OF L(L) TO S
      F0306P(L,IR) = (1.0-F0301X(L,IR))*F0307X(L,IR)
C EQN (3-17) - FLOW OF M(L) FROM REAR TO S
      R0306P(L,IR)=V(PL+L,IR)*R0301X(L,IR)*F0306P(L,IR)
     1                 *SWITCH (V(PM+L,IR))
C EQN (3-18) - ATTRITION OF M(L) AGAINST S
      A0306P(L,IB)=P0306X(L,IR)*R0306P(L,IR)*SWITCH(V(PS,IB))
      DO 5280 M=1,MB
C
C     B(M) GROUND TARGETS
C EQN (3-19) - FRACTIONAL ALLOCATION OF L(L) AGAINST B(M)
      F0307P(L,M,IR)=(1.0-F0301X(L,IR))
     1*F0308X(L,M,IR)
C EQN (3-20) - FLOW OF M(L) TO B(M)
      R0307P(L,M,IR)=V(PL+L,IR)*R0301X(L,IR)*F0307P(L,M,IR)*
     1   SWITCH(V(PM+L,IR))*DIVIDE(V(PB+M,IB),V0(PB+M,IB))
C EQN (3-21) - TOTAL AIRCRAFT ON B(M)
      V0301P(M,IB)=V(PAJ+M,IB)+V(PAJ+2+M,IB)+V(PAJ+4+M,IB)
 5280 CONTINUE
      DO 5300 J=1,JA
C EQN (3-23) - ATTRITION FOR M(L) AGAINST AB(J,1)
      A0307P(L,J,IB) = R0307P(L,1,IR)*P0307X(L,1,IR)
     1*DIVIDE(V(PAJ+2*J-1,IB)*0.9,V(PB+1,IB))
     3*SWITCH(V(PB+1,IB))
C EQN (3-24) - ATTRITION FOR M(L) AGAINST AB(J,2)
      A0308P(L,J,IB) = R0307P(L,2,IR)*P0307X(L,2,IR)
     1*DIVIDE(V(PAJ+2*J  ,IB)*0.9,V(PB+2,IB))
     2*SWITCH(V(PB+2,IB))
 5300 CONTINUE
 5320 CONTINUE
      DO 5400 J=1,JA
C
C*************************************************************************
C     3B EQUATION SET
C     AIRCRAFT VS. GROUND TARGETS
      DO 5340 I=1,IF
C
C     AG(J) VS. G1F(I)
C EQN (3-25) - ATTRITION OF AG(J) AGAINST G1F(I)
      R0321P(J,I,IR) = R0004P(J,IR)*F0103P(J,I,IR)
      A0321P(J,I,IB) = R0321P(J,I,IR)
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     1*SQRT(1.0-P0103P(I,J,IB))*P0101P(J,I,IR)
     2    *SQRT(1.0-P0104X(J,IB))*(P0101X(J,1,IR)*F0323P(J,1,IR)+
     3    P0101X(J,2,IR)*F0323P(J,2,IR))
C
C       AG(J) VS. G2F(I)
C EQN (3-26) - ATTRITION OF AG(J) AGAINST G2F(I)
      R0322P(J,I,IR) = R0004P(J,IR)*F0105P(J,I,IR)
      A0322P(J,I,IB) = R0322P(J,I,IR)
     1*SQRT(1.0-P0104P(I,J,IB))*P0102P(J,I,IR)
     2    *SQRT(1.0-P0105X(J,IB))*(P0102X(J,1,IR)*F0323P(J,1,IR)+
     3    P0102X(J,2,IR)*F0323P(J,2,IR))
 5340 CONTINUE
C
C       AG(J) VS. G1R
C EQN (3-27) - ATTRITION OF AG(J) AGAINST G1R
      R0323P(J,IR) = R0004P(J,IR)*F0106P(J,IR)
      A0323P(J,IB) = R0323P(J,IR)
     1*SQRT(1.0-P0105P(J,IB))*P0106P(J,IR)
     2    *SQRT(1.0-P0104X(J,IB))*(P0323X(J,1,IR)*F0323P(J,1,IR)+
     3    P0323X(J,2,IR)*F0323P(J,2,IR))
C
C       AG(J) VS. G2R
C EQN (3-28) - ATTRITION OF AG(J) AGAINST G2R
      R0324P(J,IR) = R0004P(J,IR)*F0107P(J,IR)
      A0324P(J,IB) = R0324P(J,IR)
     1*SQRT(1.0-P0105P(J,IB))*P0108P(J,IR)
     2    *SQRT(1.0-P0105X(J,IB))*(P0324X(J,1,IB)*F0323P(J,1,IR)+
     3    P0324X(J,2,IR)*F0323P(J,2,IR))
C
C       AG(J) VS. S
C EQN (3-29) - ATTRITION OF AG(J) AGAINST S
      R0325P(J,IR) = R0004P(J,IR)*F0108P(J,IR)
      A0325P(J,IB) = R0325P(J,IR)*SQRT(1.0-P0105P(J,IB))
     2    *SQRT(1.0-P0107X(J,IB))*(P0325X(J,1,IR)*F0323P(J,1,IR)+
     3    P0325X(J,2,IR)*F0323P(J,2,IR))
      DO 5360 L=1,LL
C
C       AG(J) VS. L(L)
C EQN (3-30) - ATTRITION OF AG(J) AGAINST L(L)
      R0326P(J,L,IR) = R0004P(J,IR)*F0109P(J,L,IR)
      A0326P(J,L,IB) = R0326P(J,L,IR)
     1*SQRT(1.0-P0105P(J,IB))*P0110P(J,L,IR)
     2    *SQRT(1.0-P0108X(L,J,IB))*(P0326X(J,L,2*IR-1)*F0323P(J,1,IR)+
     3    P0326X(J,L,2*IR)*F0323P(J,2,IR))
 5360 CONTINUE
      DO 5370 M=1,MB
      R0327P(J,M,IR)=R0004P(J,IR)*F0110P(J,M,IR)
 5370 CONTINUE
      DO 5380 I=1,JA
C
C       AG(J) VS. B(M)
C EQN (3-31) - ATTRITION OF AG(J) AGAINST B(1)
      A0327P(J,I,IB) = R0327P(J,1,IR)
     1*SQRT(1.0-P0105P(J,IB))*SQRT(1.0-P0109X(1,J,IB))
     2    *(P0327X(J,1,2*IR-1)*F0323P(J,1,IR)+P0327X(J,1,2*IR)*
     3    F0323P(J,2,IR))*DIVIDE(V(PAJ+2*I-1,IB)*0.9,V(PB+1,IB))
C EQN (3-32) - ATTRITION OF AG(J) AGAINST B(2)
```

```
      A0328P(J,I,IB) = R0327P(J,2,IR)
     1*SQRT(1.0-P0105P(J,IB))*SQRT(1.0-P0109X(2,J,IB))
     2    *(P0327X(J,2,2*IR-1)*F0323P(J,1,IR)+P0327X(J,2,2*IR)*
     3    F0323P(J,2,IR))*DIVIDE(V(PAJ+2*I   ,IB)*0.9,V(PB+2,IB))
 5380 CONTINUE
 5400 CONTINUE
 5420 CONTINUE
      DO 5460 IB=1,2
      IR=3-IB
      DO 5440 I=1,IF
C************************************************************************
C      FOURTH EQUATION SET
C      GROUND TO GROUND INTERACTIONS
C
C      G1F VS. G1F
C EQN (4- 1) ATTRITION FOR G1F(I) AGAINST G1F(I)
      A0401P(I,IB)=P0401X(IR)*(1.0-EXP(-6.9 *V(PG2F+I,IR)/V(PG1F+I,IR)))
     1    *V(PG1F+I,IR)
      A0401P(I,IB)=AMIN1(A0401P(I,IB),V(PG1F+I,IB))
C
C      G5 VS. G1
C EQN (4- 2) FLOW OF G5F(I) FROM FRONT(I) TO G1F(I)
      V0401P(I,IR)=C0406X(IR)*V(PG1F+I,IR)
      P0402P(I,IR)=1.0-EXP(-ALPHA*C0242X(IR)*AV(PG1F+I,IR))
      R0401P(I,IR)=V0401P(I,IR)*R0401X(IR)*F0401X(I,IR)*
     1    SWITCH(V(PG5F+I,IR))*P0402P(I,IR)
C EQN (4- 3) ATTRITION FOR G5F(I) AGAINST G1F(I)
      A0402P(I,IB)= P0402X(IR)*R0401P(I,IR)
C
C      G6 VS. G1
C EQN (4- 4) - FLOW OF G6F(I) FROM FRONT(I) TO G1F(I)
      V0402P(I,IR)=C0407X(IR)*V(PG1F+I,IR)
      P0403P(I,IR)=1.0-EXP(-ALPHA*C0243X(IR)*DISG2(I,IB)*AV(PG2F+I,IR))
      R0402P(I,IR)=V0402P(I,IR)*R0402X(IR)*F0402X(I,IR)*
     1    SWITCH(V(PG6F+I,IR))*P0404P(I,IR)
C EQN (4- 5) - ATTRITION FOR G6F(I) AGAINST G1F(I)
      A0403P(I,IB)= P0403X(IR)*R0402P(I,IR)
C
C      G5 VS. G2
C EQN (4- 6) - FLOW OF G5F(I) FROM FRONT(I) TO G2F(I)
      P0403P(I,IR)=1.0-EXP(-ALPHA*C0243X(IR)*AV(PG2F+I,IR))
      R0403P(I,IR)=V0401P(I,IR)*R0401X(IR)*(1.0-F0401X(I,IR))*
     1    SWITCH(V(PG5F+I,IR))*P0403P(I,IR)
C EQN (4- 7) - ATTRITION FOR G5F(I) AGAINST G2F(I)
      A0404P(I,IB)= P0404X(IR)*R0403P(I,IR)
C
C      G6 VS. G2
C EQN (4- 8) - FLOW OF G6F(I) FROM FRONT(I) TO G2F(I)
      P0405P(I,IR)=1.0-EXP(-ALPHA*C0245X(IR)*DISG2(I,IB)*AV(PG2F+I,IR))
      R0404P(I,IR)=V0402P(I,IR)*R0402X(IR)*(1.0-F0402X(I,IR))*
     1    SWITCH(V(PG6F+I,IR))*P0405P(I,IR)
C EQN (4- 9) - ATTRITION FOR G6F(I) AGAINST G2F(I)
      A0405P(I,IB)= P0405X(IR)*R0404P(I,IR)
 5440 CONTINUE
 5460 CONTINUE
      DO 5580 IB=1,2
      IR=3-IB
```

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C*************************************************************************
C      FIFTH EQUATION SET
C      FLOWS AND ASSOCIATED ATTRITION
       DO 5480 I=1,IF
C
C      G1 ATTRITION
C EQN (5-1) - TOTAL G1F(I) ATTRITION
       A0501P(I,IB)= A0301P(1,I,IB)+A0301P(2,I,IB)
      1+A0321P(1,I,IB)+A0321P(2,I,IB)+A0321P(3,I,IB)+A0401P(I,IB)
      2+A0402P(I,IB)+A0403P(I,IB)
 5480 CONTINUE
       DO 5500 J=1,JA
C
C      AIRCRAFT ATTRITION
C EQN (5-2) - ATTRITION FOR AA AGAINST A(J)
       A0511P(J,IB)= A0001P(J,IB)+A0002P(J,IB)
C EQN (5-3) - TOTAL AGS(J) ATTRITION
       A0512P(J,IB)= A0101P(1,J,IB)+A0101P(2,J,IB)+A0101P(3,J,IB)
      1+A0102P(1,J,IB)+A0102P(2,J,IB)+A0102P(3,J,IB)+A0103P(J,IB)
      2+A0104P(J,IB)+A0105P(J,IB)+A0106P(1,J,IB)
      3+A0106P(2,J,IB)+A0107P(1,J,IB)+A0107P(2,J,IB)
C EQN (5-4) - TOTAL AB(J) ATTRITION
       A0513P(1,J,IB)=A0307P(1,J,IB)+A0307P(2,J,IB)+A0327P(1,J,IB)+
      1    A0327P(2,J,IB)+A0327P(3,J,IB)
       A0513P(2,J,IB)=A0308P(1,J,IB)+A0308P(2,J,IB)+A0328P(1,J,IB)+
      1    A0328P(2,J,IB)+A0328P(3,J,IB)
C EQN (5-5) - TOTAL A(J) ATTRITION
       A0514P(J,IB)=A0511P(J,IB)+A0512P(J,IB)+A0513P(1,J,IB)+
      1    A0513P(2,J,IB)
C EQN (5-5A) - TOTAL B(M)A(J) ATTRITION
       DO 5500 M=1,MB
       A0517P(M,J,IB)=A0001P(J,IB)*F0321P(M,J,IB)+(A0002P(J,IB)+
      1    A0512P(J,IB))*F0322P(M,J,IB)+A0513P(M,J,IB)
 5500 CONTINUE
       DO 5510 M=1,MB
C
C      A4/A5 ATTRITIONS AND EXPENDITURES
C EQN (5-6) - EXPENDITURE OF A4
       E0511P(M,IB)=(R0001P(1,M,IB)*(1.0-F0001X(1,IB))+R0001P(2,M,IB)*
      1    (1.0-F0001X(2,IB))+R0001P(3,M,IB)*(1.0-F0001X(3,IB)))*
      2    E0511X(IB)+R0001P(1,M,IB)*F0001X(1,IB)*E0512X(1,2,IB)+(
      3    R0001P(2,M,IB)*F0001X(2,IB)-R0007P(2,M,IB))*E0512X(2,2,IB)+
      4    (R0001P(3,M,IB)*F0001X(3,IB)-R0007P(3,M,IB))*E0512X(3,2,IB)
C EQN (5-7) - EXPENDITURE OF A5
       E0512P(M,IB)=R0007P(1,M,IB)*E0512X(1,1,IB)+R0007P(2,M,IB)*
      1    E0512X(2,1,IB)+R0007P(3,M,IB)*E0512X(3,1,IB)
C EQN (5-8) - ASSOCIATED ATTRITION OF A4
       X2=1.0-F0001X(2,IB)*(1.0-EXP(-.15*V(PA5+M,IB)))
       X3=1.0-F0001X(3,IB)*(1.0-EXP(-.15*V(PA5+M,IB)))
       Q=DIVIDE(V(PA4+M,IB),V(PAJ+M,IB)+X2*V(PAJ+2+M,IB)+X3*V(PAJ+4+M,IB)
      1    )
       A0515P(M,IB)=A0513P(M,1,IB)*AMIN1(C0511X(IB),Q)+X2*A0513P(M,2,IB)*
      1    AMIN1(C0512X(2,IB),Q)+X3*A0513P(M,3,IB)*AMIN1(C0513X(2,IB),Q)
C EQN (5-9) - ASSOCIATED ATTRITION OF A5
       X2=1.0-X2
       X3=1.0-X3
       Q=DIVIDE(V(PA5+M,IB),X2*V(PAJ+2+M,IB)+X3*V(PAJ+4+M,IB))
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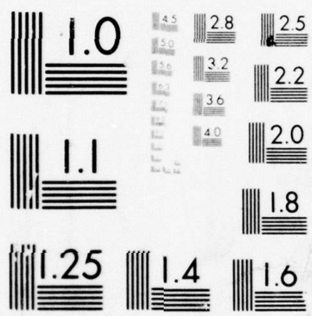

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      A0516P(M,IB)=X2*A0513P(M,2,IB)*AMIN1(C0512X(1,IB),Q)+X3*A0513P(M,
     1    3,IB)*AMIN1(C0513X(1,IB),Q)
 5510 CONTINUE
      DO 5520 I=1,IF
C
C     G2F ATTRITIONS AND EXPENDITURES
C EQN (5-10) - TOTAL ATTRITION FOR G2F(I)
      A0521P(I,IB) = A0302P(1,I,IB)+A0302P(2,I,IB)+A0322P(1,I,IB)+A0322P
     1(2,I,IB)+A0322P(3,I,IB)+A0404P(I,IB)+A0405P(I,IB)
C EQN (5-11) - ASSOCIATED ATTRITION FOR G2
      A0522P(I,IB)=A0501P(I,IB)*DIVFIX(AMIN1(C0521X(IB)*V(PG1F+I,IB),
     1    V(PG2F+I,IB)),V(PG1F+I,IB))
C EQN (5-12) - EXPENDITURE OF G2
      E0521P(I,IB)=E0521X(IB)*V(PG1F+I,IB)
     1    *(1.0-EXP(-6.9*V(PG2F+I,IB)/V(PG1F+I,IB)))
 5520 CONTINUE
C
C     G1R ATTRITIONS
C EQN (5-13) - TOTAL ATTRITION FOR G1R
      A0531P(IB)= A0303P(1,IB)+A0303P(2,IB)
     1+A0323P(1,IB)+A0323P(2,IB)+A0323P(3,IB)
C
C     G2R ATTRITIONS
C EQN (5-14) - TOTAL ATTRITION FOR G2R
      A0532P(IB)= A0304P(1,IB)+A0304P(2,IB)
     1+A0324P(1,IB)+A0324P(2,IB)+A0324P(3,IB)
C EQN (5-15) - ASSOCIATED ATTRITION FOR G2R
      A0533P(IB)=A0531P(IB)*DIVFIX(AMIN1(C0521X(IB)*V(PG1R,IB),
     1    V(PG2R,IB)),V(PG1R,IB))
C
C     S ATTRITIONS
C EQN (5-15A) - TOTAL S ATTRITION
      A0540P(IB) = A0306P(1,IB)+A0306P(2,IB)+A0325P(1,IB)+A0325P(2,IB)
     1                 +A0325P(3,IB)
      DO 5540 L=1,LL
C
C     L(L) ATTRITION
C EQN (5-16) - TOTAL L(L) ATTRITION
      A0541P(L,IB)= A0305P(1,L,IB)+A0305P(2,L,IB)
     1+A0326P(1,L,IB)+A0326P(2,L,IB)+A0326P(3,L,IB)
C
C     M(L) ATTRITIONS AND FLOWS
C
C EQN (5-17A) - NUMBER OF M(L) PER LAUNCHER
      X=DIVFIX(V(PM+L,IB),V(PL+L,IB))
      V0541P(L,IB)=AMIN1(V0541X(L,IB),X)
C
C EQN (5-17B) - NUMBER OF M(L) IN SITES
      V0542P(L,IB) = V(PM+L,IB)-V0541P(L,IB)*V(PL+L,IB)
C
C EQN (5-17C) - NUMBER OF M(L) IN TRANSIT
      V0545P(L,IB)=AMIN1(V0542P(L,IB),V0545X(L,IB))
C
C EQN (5-18A) - L(L) ASSOCIATED ATTRITION OF M(L)
      A0542P(L,IB) = V0541P(L,IB)*A0541P(L,IB)
C
C EQN (5-18B) - S ASSOCIATED ATTRITION OF M(L)
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      V0542P(L,IB)=V0542P(L,IB)-V0545P(L,IB)
      A0543P(L,IB)=V0542P(L,IB)*DIVFIX(A0540P(IB),V(PS,IB))
C EQN (5-19) - TOTAL FLOW FOR M(L)
      R0541P(L,IB)= R0301P(L,1,IB)+R0301P(L,2,IB)+R0301P(L,3,IB)
     1+R0302P(L,1,IB)+R0302P(L,2,IB)+R0302P(L,3,IB)+R0303P(L,IB)
     2+R0304P(L,IB)+R0305P(L,1,IB)+R0305P(L,2,IB)+R0306P(L,IB)
     3+R0307P(L,1,IB)+R0307P(L,2,IB)
C EQN (5-19A) - ASSOCIATED ATTRITION G2R ON M(L)
      A0544P(L,IB)=V0545P(L,IB)*A0532P(IB)*DIVFIX(1.0,V(PG2R,IB))
 5540 CONTINUE
      DO 5560 I=1,IF
C
C     G5F ATTRITIONS AND EXPENDITURES
C EQN (5-20) - ASSOCIATED ATTRITION FOR G5F(I)
      A0551P(I,IB)= C0551X(IB)*(A0522P(I,IB)+A0521P(I,IB))
     1   *DIVFIX(V(PG5F+I,IB),V(PG2F+I,IB))
C EQN (5-21) - EXPENDITURE OF G5F(I)
      E0551P(I,IB)= R0401P(I,IB)+R0403P(I,IB)
C
C     G6F ATTRITIONS AND EXPENDITURES
C EQN (5-22) - ASSOCIATED ATTRITION FOR G6F(I)
      A0552P(I,IB)= C0552X(IB)*(A0522P(I,IB)+A0521P(I,IB))
     1   *DIVFIX(V(PG6F+I,IB),V(PG2F+I,IB))
C EQN (5-23) - EXPENDITURE OF G6F(I)
      E0552P(I,IB)= R0402P(I,IB)+R0404P(I,IB)
 5560 CONTINUE
C
C     G5R ATTRITION
C EQN (5-24A) - G2 ASSOCIATED ATTRITION OF G5R
      A0561P(IB)=(A0533P(IB)+A0532P(IB))*AMIN1(V0551X(IB),V(PG5R,IB))*
     1   DIVFIX(1.0,V(PG2R,IB))
C EQN (5-24B) - S ASSOCIATED ATTRITION OF G5R
      A0563P(IB)=(V(PG5R,IB)-AMIN1(V0551X(IB),V(PG5R,IB)))*DIVFIX(
     1   A0540P(IB),V(PS,IB))
C
C     G6R ATTRITION
C EQN (5-25A) - G2 ASSOCIATED ATTRITION OF G6R
      A0562P(IB)=(A0533P(IB)+A0532P(IB))*AMIN1(V0552X(IB),V(PG6R,IB))*
     1   DIVFIX(1.0,V(PG2R,IB))
C EQN (5-25B) - S ASSOCIATED ATTRITION OF G6R
      A0564P(IB)=(V(PG6R,IB)-AMIN1(V0552X(IB),V(PG6R,IB)))*DIVFIX(
     1   A0540P(IB),V(PS,IB))
C
C     RESUPPLY RATES
C EQN (5-26) - RESUPPLY RATES
      DO 5566 M=1,MB
      DO 5565 J=1,JA
      R0571P(M,J,IB)=R0571X(M,J,IB)
 5565 CONTINUE
      R0572P(M,1,IB)=R0572X(M,1,IB)
      R0572P(M,2,IB)=R0572X(M,2,IB)
 5566 CONTINUE
      R0574P(IB) = R0574X(IB)
      R0575P(IB) = R0575X(IB)
      R0576P(IB) = R0576X(IB)
      R0577P(IB) = R0577X(IB)
      DO 5570 L=1,LL
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      R0578P(L,IB) = R0578X(L,IB)
      R0579P(L,IB) = R0579X(L,IB)
 5570 CONTINUE
 5580 CONTINUE
      DO 5800 IB=1,2
      IR=3-IB
C
C*************************************************************************
C     KINEMATIC EQUATIONS *** AT LONG LAST ***
      DO 5660 I=1,IF
C
C     F MOVEMENT
C EQN (6-1) - R(I)
      C0601P(I,IB)=DIVIDE(V(PG1F+I,IB)*A0501P(I,IR)-V(PG1F+I,IR)*
     1   A0501P(I,IB),V(PG1F+I,IB)*A0501P(I,IR)+V(PG1F+I,IR)*
     2   A0501P(I,IB))
      IF((C0601P(I,IB).NE.0.0).OR.(V(PG1F+I,IB)*A0501P(I,IR).NE.0.0))
     1   GO TO 5640
      IF(V(PG1F+I,IB)-V(PG1F+I,IR)) 5600,5640,5620
 5600 CONTINUE
      C0601P(I,IB)= -1.0
      GO TO 5640
 5620 CONTINUE
      C0601P(I,IB)= 1.0
 5640 CONTINUE
C EQN (6-2) - KINEMATIC FOR XF(I)
      DV(PXF+I,IB) = R0601X*C0601P(I,IB)*(C0601X+(1.-C0601X)*C0601P(I,IB
     1)**4)
 5660 CONTINUE
      DO 5690 M=1,MB
      DO 5680 J=1,JA
C
C     A(J) MOVEMENT
C EQN (6-3) - KINEMATIC FOR A(J)
      DV(PAJ+M-2+2*J,IB)=R0571P(M,J,IB)-A0517P(M,J,IB)
 5680 CONTINUE
C EQN (6-4) - KINEMATIC FOR A4
      DV(PA4+M,IB)=R0572P(M,2,IB)-E0511P(M,IB)-A0515P(M,IB)
C EQN (6-5) - KINEMATIC FOR A5
      DV(PA5+M,IB)=R0572P(M,1,IB)-E0512P(M,IB)-A0516P(M,IB)
 5690 CONTINUE
C
C     G1F MOVEMENT
C EQN (6-6) - G1F1 DEMAND FUNCTION
      D0601P(1,IB)=C0605X(IB)*(V0601X(1,IB)-V(PG1F+1,IB))*R0602X(IB)*(F0
     1601X(1,IB)*R0601X-DV(PXF+1,IB))+C0603X(1,IB)*A0501P(1,IB)
      DO 5700 I=2,IF
C EQN (6-7) - G1F2 G1F3 DEMAND FUNCTION
      D0601P(I,IB)=C0605X(IB)*(V0601X(I,IB)-V(PG1F+I,IB))*R0602X(IB)*(F0
     1601X(I,IB)*DV(PXF+1,IB)-DV(PXF+I,IB))+C0603X(I,IB)*A0501P(I,IB)
 5700 CONTINUE
      DO 5720 I=1,IF
C EQN (6-8) - FLOW OF G1R TO F(I)
      R0601P(I,IB)=R0602X(IB)*(V(PG1R,IB)*(1.0-EXP(DIVIDE(-C0604X(IB)*
     1   SWITC(D0601P(I,IB))*D0601P(I,IB),R0602X(IB)*V(PG1R,IB)))) -
     2   SWITC(-D0601P(I,IB))*V(PG1F+I,IB))
C EQN (6-9) - KINEMATIC FOR G1F(I)
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      DV(PG1F+I,IB)=R0601P(I,IB)-A0501P(I,IB)
      OFLOW=0.0
      IF(R0601P(I,IB).LT.0) OFLOW=R0601P(I,IB)
      DAV(PG1F+I,IR)=C0251X(IR)*(V(PG1F+I,IB)-AV(PG1F+I,IR))-C0261X(IR)*
     1   AV(PG1F+I,IR)-A0501P(I,IB)+OFLOW*DIVIDE(AV(PG1F+I,IR),
     2   V(PG1F+I,IB))
C EQN (6-10) - G2F(I) DEMAND FUNCTION
      V0601P(I,IB)=V(PG1F+I,IB)*C0522X(IB)
      D0602P(I,IB)=(V0601P(I,IB)-V(PG2F+I,IB))*R0603X(IB)+C0607X(IB)*
     1   (A0521P(I,IB)+E0521P(I,IB))
C
C     G2F MOVEMENT
C EQN (6-11) - FLOW OF G2R TO F(I)
      R0602P(I,IB)=R0603X(IB)*(V(PG2R,IB)*(1.0-EXP(DIVIDE(-C0604X(IB)*
     1   SWITC(D0602P(I,IB))*D0602P(I,IB),R0603X(IB)*V(PG2R,IB)))) -
     2   SWITC(-D0602P(I,IB))*V(PG2F+I,IB))+R0601P(I,IB)*(C0606X(IB)*
     3   SWITC(R0601P(I,IB)*V(PG2R,IB))+DIVFIX(V(PG2F+I,IB),V(PG1F+I,IB
     4   ))*SWITC(-R0601P(I,IB)))
C EQN (6-12) - KINEMATIC FOR G2F(I)
      DV(PG2F+I,IB)=R0602P(I,IB)-E0521P(I,IB)-A0522P(I,IB)-A0521P(I,IB)
      OFLOW=0.0
      IF(R0602P(I,IB).LT.0) OFLOW=R0602P(I,IB)
      DAV(PG2F+I,IR)=C0252X(IR)*(V(PG2F+I,IB)-AV(PG2F+I,IR))-C0262X(IR)*
     1   AV(PG2F+I,IR)-A0521P(I,IB)-(E0521P(I,IB)+A0522P(I,IR)-OFLOW)*
     2   DIVIDE(AV(PG2F+I,IR),V(PG2F+I,IB))
 5720 CONTINUE
C
C     G1R MOVEMENT
C EQN (6-13) - G1R KINEMATIC
      DV(PG1R,IB)=R0574P(IB)-R0601P(1,IB)-R0601P(2,IB)-R0601P(3,IB)-
     1   A0531P(IB)
      OFLOW=0.0
      IF((R0601P(1,IB)+R0601P(2,IB)+R0601P(3,IB)).GT.0) OFLOW=
     1   R0601P(1,IB)+R0601P(2,IB)+R0601P(3,IB)
      DAV(PG1R,IR)=C0253X(IR)*(V(PG1R,IB)-AV(PG1R,IR))-C0263X(IR)*
     1   AV(PG1R,IR)-A0531P(IB)-OFLOW*DIVIDE(AV(PG1R,IR),V(PG1R,IB))
C
C     G2R MOVEMENT
C EQN (6-14) - G2R KINEMATIC
      DV(PG2R,IB)=R0575P(IB)-R0602P(1,IB)-R0602P(2,IB)-R0602P(3,IB)-
     1   A0533P(IB)-A0532P(IB)
      OFLOW=0.0
      IF((R0602P(1,IB)+R0602P(2,IB)+R0602P(3,IB)).GT.0) OFLOW=
     1   R0602P(1,IB)+R0602P(2,IB)+R0602P(3,IB)
      DAV(PG2R,IR)=C0254X(IR)*(V(PG2R,IB)-AV(PG2R,IR))-C0264X(IR)*
     1   AV(PG2R,IR)-A0532P(IB)-(A0533P(IB)+OFLOW)*DIVIDE(AV(PG2R,IR),
     2   V(PG2R,IB))
      DO 5740 L=1,LL
C
C     M(L) MOVEMENT
C EQN (6-15) - M(L) KINEMATIC
      DV(PM+L,IB)=R0578P(L,IB)-R0541P(L,IB)-A0542P(L,IB)-A0543P(L,IB)-
     1   A0544P(L,IB)
C
C     L(L) MOVEMENT
C EQN (6-16) - L(L) KINEMATIC
      DV(PL+L,IB)=R0579P(L,IB)-A0541P(L,IB)
```

```
      DAV(PL+L,IR)=C0255X(L,IR)*(V(PL+L,IB)-AV(PL+L,IR))-C0265X(L,IR)*
     1   AV(PL+L,IR)-A0541P(L,IB)
 5740 CONTINUE
      DO 5760 M=1,MB
C
C     B(M) MOVEMENT
C EQN (6-17) - B(M) KINEMATIC
      DV(PB+M,IB)=0.0
 5760 CONTINUE
      DO 5780 I=1,IF
C
C     G5F(I) MOVEMENT
C EQN (6-18) - G5F(I) DEMAND FUNCTION
      D0603P(I,IB) = C0611X(IB)*(V0401P(I,IB)*R0401X(IB)*(F0401X(I,IB)*(
     1   P0402P(I,IB))+(1.0-F0401X(I,IB))*P0403P(I,IB))+A0551P(I,IB))
C EQN (6-19) - FLOW OF G5R TO F(I)
      R0603P(I,IB)=R0604X(IB)*V(PG5R,IB)*(1.0-EXP(-C0604X(IB)*
     1   D0603P(I,IB)/(R0604X(IB)*V(PG5R,IB)+1.0)))+R0601P(I,IB)*(
     2   C0610X(IB)*SWITCH(R0601P(I,IB)*V(PG5R,IB))+DIVFIX
     3(V(PG5F+I,IB),V(PG1F+I,IB))*SWITCH(-R0601P(I,IB)))
C EQN (6-20) - G5F(I) KINEMATIC
      DV(PG5F+I,IB)=R0603P(I,IB)-E0551P(I,IB)-A0551P(I,IB)
C
C     G6F(I) MOVEMENT
C EQN (6-21) - G6F(I) DEMAND FUNCTION
      D0604P(I,IB) = C0614X(IB)*(V0402P(I,IB)*R0402X(IB)*(F0402X(I,IB)*(
     1   P0404P(I,IB))+(1.0-F0402X(I,IB))*P0405P(I,IB))+A0552P(I,IB))
C EQN (6-22) - FLOW OF G6R TO F(I)
      R0604P(I,IB)=R0605X(IB)*V(PG6R,IB)*(1.0-EXP(-C0604X(IB)*
     1   D0604P(I,IB)/(R0605X(IB)*V(PG6R,IB)+1.0)))+R0601P(I,IB)*(
     2   C0613X(IB)*SWITCH(R0601P(I,IB)*V(PG6R,IB))
     3+DIVFIX(V(PG6F+I,IB),V(PG1F+I,IB))*SWITCH(-R0601P(I,IB)))
C EQN (6-23) - G6F(I) KINEMATIC
      DV(PG6F+I,IB)=R0604P(I,IB)-E0552P(I,IB)-A0552P(I,IB)
 5780 CONTINUE
C
C     G5R MOVEMENT
C EQN (6-24) - G5R KINEMATIC
      DV(PG5R,IB)=R0576P(IB)-R0603P(1,IB)
     1-R0603P(2,IB)-R0603P(3,IB)-A0561P(IB)
     2-A0563P(IB)
C
C     G6R MOVEMENT
C EQN (6-25) - G6R KINEMATIC
      DV(PG6R,IB)=R0577P(IB)-R0604P(1,IB)
     1-R0604P(2,IB)-R0604P(3,IB)-A0562P(IB)
     2-A0564P(IB)
C
C     S MOVEMENT
C EQN (6-26) - S KINEMATIC
      DV(PS,IB)=-A0540P(IB)
 5800 CONTINUE
      GO TO 4100
 6000 CONTINUE
C     ERROR PROCESSING
      WRITE(6,600)
      STOP 2
```

```
 7000 CONTINUE
      MODFLG=.FALSE.
      IF(TIME.GE.TEND) GO TO 7150
      IF(ABS(TIME-TOUTER).LT.1.0E-6) TIME=TOUTER
      IF(TIME.LT.TOUTER) GO TO 7150
C     *WE'RE AT A MODIFY POINT: PROCESS MODIFY CARDS
      NLINES=0
 7080 DO 7100 I=1,4
      IF(INDEX(I).EQ.0) GO TO 7100
      IF(INDEX(I).GT.0) GO TO 7095
      K=-INDEX(I)
      IF(K.GT.20) GOTO 7094
C     *MOVING A PORTION OF AIR RESOURCES BETWEEN FORWARD AND REAR BASES
      J=1
      IF(K.GT.10) J=2
      IF(K.GT.10) K=K-10
      M=2
      IF(K.GT.5) M=1
      IF(K.GT.5) K=K-5
      GO TO (7091,7091,7091,7092,7093),K
 7091 V(PAJ+M+K*2-2,J)=V(PAJ+1+2*K-M,J)*VAL(I)+V(PAJ+M-2+2*K,J)
      V(PAJ+1+2*K-M,J)=(1.0-VAL(I))*V(PAJ+1+2*K-M,J)
      GO TO 7100
 7092 V(PA4+M,J)=V(PA4+M,J)+V(PA4+3-M,J)*VAL(I)
      V(PA4+3-M,J)=(1.0-VAL(I))*V(PA4+3-M,J)
      GO TO 7100
 7093 V(PA5+M,J)=V(PA5+M,J)+VAL(I)*V(PA5+3-M,J)
      V(PA5+3-M,J)=(1.0-VAL(I))*V(PA5+3-M,J)
      GO TO 7100
 7094 CONTINUE
C     *CHANGING DATA POINT INTERVAL: FORCE A DATA POINT NOW
      TOUT = TIME
      DTINER = VAL(I)
      WRITE (6,601) DTINER
      GO TO 7100
 7095 CONTINUE
C     *CHANGING A COEFFICIENT VALUE
      K=INDEX(I)
      IF (K.GT.780) GO TO 7100
      XCOEF(K) = VAL(I)
      CALL LCHPTR(1H ,TIT4,30,DATE,NLINES,-55)
      IF(NLINES.EQ.2) WRITE(6,208) TIME
      WRITE (6,209) K,XNAME(K),FLEMNT(K),VAL(I)
C     *IF THIS IS A V0 COEFFICIENT, ALSO RESET THE CORRESPONDING V VARIABLE
      IF(K.GT.704) PV(K-704) = VAL(I)
 7100 CONTINUE
C     *CHECK FOR NEXT MODIFY CARD
      READ(5,104) CARD
      IF(EOF(5)) 7110,7120
 7110 TOUTER = TEND
      DO 7115 I=1,4
 7115 VAL(I)=0
      GO TO 7145
 7120 IF(CARD(1).EQ.TYPE) GO TO 7140
      WRITE(6,302) CARD
      WRITE(6,301) TYPE
      STOP
```

```
 7140 DECODE(70,401,CARD(2)) T,(INDEX(I), VAL(I),I=1,4)
      IF(T.LE.TIME) GO TO 7080
C     *WE'VE FINISHED ALL MODIFICATIONS FOR THIS TIME POINT.
      TOUTER = T
C     *SEE IF THIS IS A DATA POINT
 7145 IF(TIME.LT.TOUT) GO TO 3000
      MODFLG=.TRUE.
 7150 CONTINUE
C     *THIS IS A DATA POINT.  WRITE OUT MODEL STATE AND SET
C      THE NEXT DATA POINT
      WRITE(3) TIME,(XCOEF(I),I=1,NXC), (PV(I), I=1,NV),
     +(PDV(I),I=1,NDV)
      IF(TIME.GE.TEND) GO TO 8000
      TOUT=TOUT+DTINER
      IF(TOUT.GT.TEND) TOUT=TEND
      IF(MODFLG) GO TO 3000
      GO TO 4000
 8000 CONTINUE
C     END PROCESSING
      STOP1
  104 FORMAT (8A10)
  208 FORMAT (//* PARAMETERS MODIFIED AT TIME = *,F10.5//)
  209 FORMAT (10X, *XCOEF(*,I3,*) = *,2A10,* = *,E13.6)
  301 FORMAT(//1X,5H*****,* ABOVE CARD MISPLACED OR UNIDENTIFIABLE*,
     1    5X,*EXPECTED CARD TYPE *,A10)
  302 FORMAT (//5X,8A10)
  401 FORMAT (F10.0,4(I5,F10.0))
  600 FORMAT(* PROCESSING ERROR*)
  601 FORMAT(1X/10X,*NEW TIME INTERVAL =*,F12.5/)
      END
```

```
      SUBROUTINE ARTMODL(DATE,INDEX,VAL,NXC,NV,TIME,SWT2,NOV)
C          ARTMODL IS THE MODELING ROUTINE FOR THE ARTILLERY VERSION
C     OF THE COMBAT II SYSTEM. IT IS CALLED BY ARTINPT WHICH SETS UP
C     THE INITIAL STATES, FLOW PARAMETERS, AND COEFFICIENTS OF THE
C     VARIOUS DEPENDENCIES AMONG VARIABLES.  THE SIMULATION IS A DOUBLE LOOP
C     -- THE OUTER LOOP WRITES ON TAPE 3 THE VALUES OF ALL QUANTITY AND
C     FLOW VARIABLES AT PRE SET TIME INTERVALS.  THE INNER LOOP IS THE
C     ACTUAL INTEGRATION LOOP; IT TIME-STEPS THROUGH THE INTERVAL,
C     CALLING INTEG TO INTEGRATE A SYSTEM OF ORDINARY DIFFERENTIAL
C     EQUATIONS (THE FLOWS AND ATTRITION RATES), THEN SETTING THE VALUES
C     OF ALL THE QUANTITY VARIABLES DEPENDENT ON THE INTEGRATED VARIABLES.
C     THE INNER LOOP JUMPS OUT TO THE OUTER LOOP EACH TIME ONE OF THE
C     WRITE TIME INTERVALS IS REACHED.
C
C          THE EQUATIONS ARE DIVIDED INTO SIX MAJOR SETS; THOSE DEALING
C     WITH AIR-TO-AIR COMBAT, GROUND DEFENSE AGAINST AIR ATTACK,
C     MISSILE AND AIRCRAFT ATTACKS ON GROUND TARGETS, GROUND-TO-GROUND
C     INTERACTIONS, FLOWS AND ATTRITIONS, AND THE KINEMATICS OF THE
C     MOVEMENTS OF FORCES, FRONTS, AND SUPPLIES.
C
      COMMON /XCOEF/ C0010X(2),C0020X(2),C0030X(2),C0040X(2),
     1   C0050X(2,2),C0060X(5,2),C0070X(5,2),C0211X(3,2),C0212X(3,2),
     2   C0213X(3,2),C0214X(3,2),C0215X(3,2,2),C0216X(3,5,2),
     3   C0217X(3,5,2),C0231X(2,2),C0232X(2,2),C0233X(2,2),C0234X(2,2),
     4   C0235X(2,2,2),C0236X(2,5,2),C0237X(2,5,2),C0242X(5,2),
     5   C0243X(5,2),C0244X(5,5,2),C0251X(2),C0252X(2),C0253X(2),
     6   C0254X(2),C0255X(2,2),C0256X(5,2),C0257X(5,2),C0261X(2),
     7   C0262X(2),C0263X(2),C0264X(2),C0265X(2,2),C0266X(5,2),
     8   C0267X(5,2),C0307X(2,2,2),C0511X(2),C0512X(2,2),C0513X(2,2),
     9C0521X(2),C0522X(2),C0523X(5,2),C0601X,C0603X(3,2),C0604X(2),C0605
     *X(2),C0606X(2),C0607X(2),C0610X(5,2),C0611X(5,2),C0612X(5,2),
     1   E0511X(2),E0512X(2),E0513X(2,2),E0514X(2,2),E0521X(2),
     2   F0001X(3,2),F0101X(3,2),F0102X(2),F0103X(2),F0104X(3,2),
     3   F0105X(3,2),F0106X(3,2),F0107X(3,2,2),F0108X(3,2,2),F0109X(2),
     4   F0110X(5,2),F0111X(3,5,2),F0201X(3,3,2),F0202X(3,3,2),
     5   F0203X(3,15,2),F0301X(2,2),F0302X(2,3,2),
     6   F0303X(2,3,2),F0304X(2,2),F0305X(2,2),F0306X(2,2,2),
     7F0307X(2,2),F0308X(2,2,2),F0309X(3,2,2),F0310X(2,15,2),F0311X(2,5,
     82),F0312X(2,3,2),F0402X(5,2),F0403X(5,2),F0404X(5,5,2)
C
      COMMON /XCOEF/ F0601X(3,2),P0001X(3,3,2),P0002X(3,3,2),
     1   P0003X(3,3,2),P0004X(3,3,2),P0101X(3,2,2),P0102X(3,2,2),
     2   P0103X(3,2),P0104X(3,2),P0105X(3,2),P0107X(3,2),P0108X(2,3,2),
     3   P0109X(2,3,2),P0110X(5,3,2)                 ,P0301X(2,2),
     4   P0302X(2,2),P0303X(2,2),P0304X(2,2),P0305X(2,2,2),P0306X(2,2),
     5   P0307X(2,2,2),P0308X(2,5,2),P0309X(2,5,2),P0323X(3,2,2),
     6   P0324X(3,2,2),P0325X(3,2,2),P0326X(3,2,4),P0327X(3,2,4),
     7   P0328X(3,5,4),P0329X(3,5,4),P0401X(2),P0402X(5,2),P0403X(5,2),
     8   P0404X(5,5,2),R0001X(3,2),R0301X(2,2),R0402X(5,2),
     9   R0571X(3,2),R0572X(2),R0573X(2),R0574X(2),R0575X(2),
     *   R0576X(5,2),R0577X(5,2),R0578X(2,2),R0579X(2,2),R0601X,
     1   R0602X(2),R0603X(2),R0604X(5,2),R0605X(5,2),R0700X(2,2),
     2   V0541X(2,2),V0545X(2,2),V0551X(5,2),V0601X(3,2),V0602X(5,3,2),
     3   V0700X(2),V0(65,2)
C
      COMMON /PV/ V(65,2),AV(30,2),VA(1760),C0001P(3,3,2),C0002P(3,3,2),
     1   C0003P(2,2),C0004P(3,2),C0601P(3,2),D0601P(3,2),D0602P(3,2),
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2    D0603P(5,3,2),D0604P(5,3,2),F0101P(3,3,2),F0103P(3,3,2),
3    F0105P(3,3,2),F0106P(3,2),F0107P(3,2),F0108P(3,2),F0109P(3,2,2)
4    ,F0110P(3,2,2),F0112P(3,15,2),F0113P(3,5,2),F0301P(2,3,2),
5    F0302P(2,3,2),F0303P(2,2),F0304P(2,2),F0305P(2,2,2),F0306P(2,2)
6    ,F0307P(2,2,2),F0308P(2,15,2),F0309P(2,5,2),P0101P(3,3,2),
7    P0102P(3,3,2),P0103P(3,3,2),P0104P(3,3,2),P0105P(3,2),
8    P0106P(3,2),P0108P(3,2),P0110P(3,2,2),P0111P(3,15,2),
9    P0112P(15,3,2),P0113P(3,5,2),P0301P(2,3,2),P0302P(2,3,2),
*    P0303P(2,2),P0304P(2,2),P0305P(2,2,2),P0306P(2,15,2),
1    P0307P(2,5,2),P0402P(5,3,2),P0403P(5,3,2),P0404P(5,15,2),
2    V0301P(2,2),V0541P(2,2),V0542P(2,2),V0545P(2,2),V0546P(5,3,2),
3    V0547P(5,2),V0548P(5,3,2),V0549P(5,2),V0550P(5,2),V0601P(3,2),
4    V0602P(5,3,2),V0603P(5,3,2)
C
      COMMON /PDV/ DV(65,2),DAV(30,2),A0001P(3,2),A0002P(3,2),
1    A0101P(3,3,2),A0102P(3,3,2),A0103P(3,2),A0104P(3,2),A0105P(3,2)
2    ,A0106P(2,3,2),A0107P(2,3,2),A0108P(15,3,2),A0109P(5,3,2),
3    A0301P(2,3,2),A0302P(2,3,2),A0303P(2,2),A0304P(2,2),
4    A0305P(2,2,2),A0306P(2,2),A0307P(2,3,2),A0308P(2,3,2),
5    A0309P(2,15,2),A0310P(2,5,2),A0321P(3,3,2),A0322P(3,3,2),
6    A0323P(3,2),A0324P(3,2),A0325P(3,2),A0326P(3,2,2),A0327P(3,3,2)
7    ,A0328P(3,3,2),A0329P(3,15,2),A0330P(3,5,2),A0401P(3,2),
8    A0402P(5,3,2),A0403P(5,3,2),A0404P(5,15,2),A0501P(3,2),
9    A0502P(5,3,2),A0503P(5,2),A0511P(3,2),A0512P(3,2),A0513P(3,2),
*    A0514P(3,2),A0515P(2),A0516P(2),A0521P(3,2),A0522P(3,2),
1    A0523P(5,3,2),A0531P(2),A0532P(2),A0533P(2),A0534P(5,2),
2    A0540P(2),A0541P(2,2),A0542P(2,2),A0543P(2,2),A0544P(2,2),
3    A0551P(5,3,2),A0561P(5,2),A0571P(5,3,2),A0572P(5,2),A0573P(5,2)
4    ,E0511P(2),E0512P(2),E0521P(3,2),E0551P(5,3,2),R0001P(3,2),
5    R0002P(3,2),R0003P(3,2),R0004P(3,2),R0005P(2),R0301P(2,3,2),
6   R0302P(2,3,2),R0303P(2,2),R0304P(2,2),R0305P(2,2,2),R0306P(2,2),
7    R0307P(2,2,2),R0308P(2,15,2),R0309P(2,5,2),R0321P(3,3,2)
8    ,DP(508)
C
      DIMENSION R0322P(3,3,2),R0323P(3,2),R0324P(3,2),R0325P(3,2),
1    R0326P(3,2,2),R0327P(3,2,2),R0328P(3,15,2),R0329P(3,5,2),
2R0402P(5,3,2),R0403P(5,3,2),R0404P(5,15,2),R0541P(2,2),R0571P(3,2)
3   ,R0572P(2),R0573P(2),R0574P(2),R0575P(2),R0576P(5,2),R0577P(5,2)
4    ,R0578P(2,2),R0579P(2,2),R0601P(3,2),R0602P(3,2),R0603P(5,3,2),
5    R0604P(5,3,2)
      COMMON /XINTEG/ TINC,DELT,ERROR,DTINER,TOUTER,TEND,CARD(8),ALPHA
      COMMON/DICT/PNAME(3236),PELMNT(3236),SWT3,QX1,QX2,QX3,
1   FLOWAD,QR,QF,QA
      COMMON /DICT2/  XNAME(1700),ELEMNT(1700)
      DIMENSION INDEX(4),VAL(4)
      DIMENSION XCOEF(1),PDV(1),PV(1),TIT4(3)
      DIMENSION DISG2(4,2)
      DIMENSION FLOWAD(5,2)
      EQUIVALENCE (XCOEF(1),C0010X(1)),(PDV(1),DV(1,1))
      EQUIVALENCE (DP(1),R0322P(1,1,1)),(DP(19),R0323P(1,1)),(DP(25),
1    R0324P(1,1)),(DP(31),R0325P(1,1)),(DP(37),R0326P(1,1,1)),(DP(49
3    ),R0327P(1,1,1)),(DP(61),R0328P(1,1,1)),(DP(151),R0329P(1,1,1))
3    ,(DP(181),R0402P(1,1,1)),(DP(211),R0403P(1,1,1)),(DP(241),R0404
4    P(1,1,1)),(DP(391),R0541P(1,1)),(DP(395),R0571P(1,1)),
5    (DP(401),R0572P(1)),(DP(403),R0573P(1)),(DP(405),R0574P(1)),(DP
6   (407),R0575P(1)),(DP(409),R0576P(1,1)),(DP(419),R0577P(1,1)),(
7    DP(429),R0578P(1,1)),(DP(433),R0579P(1,1)),(DP(437),R0601P(1,1)
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     8    ),( DP(443),R0602P(1,1)),(DP(449),R0603P(1,1,1)),(DP(479),R0604
     9    P(1,1,1))
     1    ,(PV(1),V(1,1))
      DIMENSION SWT2(2)
      INTEGER PAJ,PA4,PA5,PG1F,PG1R,PG2F,PG2R,PW,PWR,PR,PRR,PL,PS,PM,PB,
     1    PSB,PXF
      LOGICAL MODFLG
      DATA FLOWAD /.049,.147,.02,.073,.801,.063,.38,.46,.16,3,19/
      DATA PG1F/0/,PG1R/4/,PW/4/,PWR/19/,PL/24/,PG2F/26/,PG2R/30/,PR/30/
     1    ,PRR/45/,PM/50/,PS/53/,PB/53/,PSB/55/,PAJ/57/,PA4/61/,PA5/62/,
     2    PXF/62/,JA/3/,IF/3/,NW/5/,LL/2/,MB/2/,SWT3/0/
C  THE VARIABLES THAT ARE GIVEN VALUES IN THE ABOVE DATA STATEMENTS
C  ARE OF TWO TYPES
C        FLOWAD(K,I) IS THE ADDITIONAL FLOW OF WEAPON SYSTEM K, SIDE I,
C           ASSOCIATED WITH THE MOVEMENT OF GROUND FORCES BETWEEN THE
C           REAR AND THE FRONTS.
C        PG1F, PG1R, PW, AND SO ON, ARE USED TO DERIVE THE INDICES IN
C           ARRAYS V AND V0 FOR THE DIFFERENT ENTITIES KEPT TRACK OF BY
C           COMBAT-II.  FOR EXAMPLE, PW+(3K-I)+1 IS THE INDEX FOR THE
C           WEAPON SYSTEM OF TYPE K AT FRONT I, AND V(PW+(3K-I)+1,J) IS
C           THE CURRENT NUMBER OF WEAPON SYSTEM K AT FRONT I FOR SIDE J.
C           TO AVOID DUPLICATION OF EQUATIONS BELOW, THIS SORT OF NOTATION
C           APPEARS INSTEAD OF HARD-WIRED INDICES. THE MEANINGS OF THE
C           OTHER INDICES ARE AS FOLLOWS
C              PG1F+I     - GROUND FORCES IN FRONT I
C              PG1R       - GROUND FORCES IN THE REAR
C              PWR+K      - WEAPON SYSTEM K IN THE REAR
C              PL+M       - LAUNCHERS FOR MISSILE M
C              PG2F+I     - SUPPLIES IN FRONT I
C              PG2R       - SUPPLIES IN THE REAR
C              PR+(3K-I)+1 - ROUNDS FOR WEAPON SYSTEM K IN FRONT I
C              PRR+K      - ROUNDS FOR WEAPON SYSTEM K IN THE REAR
C              PM+M       - MISSILES OF TYPE M
C              PS         - NUCLEAR STORAGE SITES
C              PB+K       - AIR BASE OF TYPE K
C              PSB+K      - REPAIR STATUS OF AIR BASE K
C              PAJ+I      - AIRCRAFT OF TYPE I
C              PA4        - CONVENTIONAL AIRCRAFT LOADS
C              PA5        - NUCLEAR AIRCRAFT LOADS
C              PXF+I      - COORDINATE OF THE FEBA IN FRONT I
C
C        THE FOLLOWING VARIABLES OCCUR BELOW AS THE LIMITS OF DO LOOPS
C           JA    -  NUMBER OF AIRCRAFT TYPES
C           IF    -  NUMBER OF FRONTS
C           LL    -  NUMBER OF MISSILE TYPES
C           MB    -  NUMBER OF AIR BASE TYPES
C           NW    -  NUMBER OF WEAPON SYSTEMS
C
C        OTHER VARIBLES OCCURRING IN THIS SUBROUTINE ARE
C           SWT2(I)     - REAL FLAG CONTAINING THE VALUE 1 OR 2.
C                         SWT2(I)=1 INDICATES SIDE I IS FLYING NUCLEAR
C                         WEAPONRY.
C           SWT3        - LOGICAL FLAG CAUSES INTEGRATION SUMMARY TO BE
C                         PRINTED
C           NDEQ        - COUNTER FOR THE NUMBER OF INTEGRATION STEPS
C                         PERFORMED SINCE THE LAST TIME HISTORY OUTPUT.
C           XKJ         - VALUE OF THE CPU CLOCK
```

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C            ALPHA      - OVERALL TARGET ACQUISITION ADJUSTMENT FACTOR
C            IB,IR      - INTEGER FLAG HOLDING EITHER 1 OR 2, USED TO
C                         DEFINE WHICH PLAYER'S VALUES ARE BEING USED.
C                         IB = 3-IR
C            TOUT       - TIME OF THE NEXT ENTRY TO THE TIME HISTORY FILE.
C            TOUTER     - TIME OF THE NEXT USER MODIFICATION TO THE DATA
C                         BASE.
C            DTINER     - TIME STEP TO TOUT.
C            TEND       - MODEL RUN END TIME.
      DATA NORDER/1950/,NCOMOD/65/
      DATA TYPE  /10HMODIFY    /
      DATA TIT4/10HMODIFIED C,10HOEFFICIENT,10H VALUES   /
C
      PRINT 1
    1 FORMAT(1H-)
      IF(TIME.GT.0.0) GO TO 1260
      TIME=ABS(TIME)
C     INITIALIZE STATE VECTOR
      DO 1200 I=1,2
      DO 1100 J=1,NCOMOD
      V(J,I) = VO(J,I)
 1100 CONTINUE
      IR=I
      IB=3-IR
C     SETUP OF NA POOL
      AV(PG1F+1,IB)=V(PG1F+1,IR)*C0010X(IB)
      AV(PG1F+2,IB)=V(PG1F+2,IR)*C0010X(IB)
      AV(PG1F+3,IB)=V(PG1F+3,IR)*C0010X(IB)
      AV(PG2F+1,IB)=V(PG2F+1,IR)*C0020X(IB)
      AV(PG2F+2,IB)=V(PG2F+2,IR)*C0020X(IB)
      AV(PG2F+3,IB)=V(PG2F+3,IR)*C0020X(IB)
      AV(PG1R,IB)=V(PG1R,IR)*C0030X(IB)
      AV(PG2R,IB)=V(PG2R,IR)*C0040X(IB)
      DO 1110 K=1,NW
      AV(PW+3*K-2,IB)=V(PW+3*K-2,IR)*C0060X(K,IB)
      AV(PW+3*K-1,IB)=V(PW+3*K-1,IR)*C0060X(K,IB)
      AV(PW+3*K  ,IB)=V(PW+3*K  ,IR)*C0060X(K,IB)
      AV(PWR+K,IB)=V(PWR+K,IR)*C0070X(K,IB)
 1110 CONTINUE
      AV(PL+1,IB)=V(PL+1,IR)*C0050X(1,IB)
      AV(PL+2,IB)=V(PL+2,IR)*C0050X(2,IB)
 1200 CONTINUE
      DO 1250 I=1,NDV
 1250 PDV(I)=0.0
 1260 CONTINUE
C    WRITE OUT THE INITIAL DATA POINT TO THE OUTPUT TAPE
      WRITE(3) TIME,(XCOEF(I),I=1,NXC),(PV(I),I=1,NV),(PDV(I),I=1,NDV),
     1   SWT2(1),SWT2(2)
      H=TIME
      TOUT=DTINER+TIME
      Q1=Q2=2
 3000 CONTINUE
C
C     OUTER LOOP PROCESSING BEGINS
C
C     INTEGRATION LOOP
      TLIM = AMIN1(TINC,DTINER/2.0)
```

```
      DT = DELT
      JUMP = -1
      SWT2(1)=Q1
      SWT2(2)=Q2
 4000 CONTINUE
C
C     INNER LOOP PROCESSING BEGINS
C
      Q1=Q2=1
      IF((V(PA5,1).LT.V0700X(1)*V0(PA5,1)).OR.(V(PA5,1).LE.0.0).OR.
     1   (V0(PA5,1).LE.0.0)) Q1=2
      IF((V(PA5,2).LT.V0700X(2)*V0(PA5,2)).OR.(V(PA5,2).LE.0.0).OR.
     1   (V0(PA5,2).LE.0.0)) Q2=2
      IF((V(PG1F+1,1)+V(PG1F+2,1)+V(PG1F+3,1).LE.6.0).OR.(V(PG1F+1,2)+
     1   V(PG1F+2,2)+V(PG1F+3,2).LE.6.0)) STOP5
      IF((Q1.NE.SWT2(1)).OR.(Q2.NE.SWT2(2))) GO TO 3000
      DTINER2=AMIN1(TOUTER,TOUT)-TIME
      IF(DTINER2.LT.DELT) DTINER2=DELT
      CALL SECOND(XKJ)
      IF(SWT3.EQ.1) WRITE(6,1945) TIME,TOUTER,TOUT,XKJ,NDEQ
      TIME=TIME+DTINER2
 1945 FORMAT(6X,5HTIME=,F8.2,5X,12HNEXT CHANGE=,F8.2,5X,
     1   16HNEXT DATA POINT=,F8.2/11X,10HCPU TOTAL=,F8.4,5X,
     2   22HDEQS IN LAST INTERVAL=,I5/)
      NDEQ=0
 4100 CONTINUE
      NDEQ=NDEQ+1
      EMAX = ERROR
      EMIN = EMAX/100.
      CONV = EMIN/100.
C
C     PERFORM THE INTEGRATION
C
      CALL INTEG(DV,H,TIME,TLIM,V,EMAX,EMIN,NORDER,DT,CONV,JUMP)
C     RESTRICT COMMODITIES TO NON-NEGATIVE VALUES
      DO 5015 J=1,2
      IF(V0(PG1F+1,J)+V0(PG1F+2,J)+V0(PG1F+3,J)+V0(PG1R,J)+R0574X(J).LT.
     1   .01) V(PG1F+1,J)=V(PG1F+2,J)=V(PG1F+3,J)=V(PG1R,J)=0.0
      IF(V0(PG2F+1,J)+V0(PG2F+2,J)+V0(PG2F+3,J)+V0(PG2R,J)+R0575X(J).LT.
     1   .01) V(PG2F+1,J)=V(PG2F+2,J)=V(PG2F+3,J)=V(PG2R,J)=0.0
      DO 4050 K=1,NW
      IF(V0(PW+3*K-2,J)+V0(PW+3*K-1,J)+V0(PW+3*K,J)+V0(PWR+K,J)+
     1   R0576P(K,J).LE..01) V(PW+3*K-2,J)=V(PW+3*K-1,J)=V(PW+3*K,J)=
     2   V(PWR+K,J)=0.0
      IF(V0(PR+3*K-2,J)+V0(PR+3*K-1,J)+V0(PR+3*K,J)+V0(PRR+K,J)+
     1   R0577P(K,J).LE..01) V(PR+3*K-2,J)=V(PR+3*K-1,J)=V(PR+3*K,J)=
     2   V(PRR+K,J)=0.0
 4050 CONTINUE
      DO 4051 M=1,2
      IF(V0(PM+M,J)+R0578X(M,J).LT..01) V(PM+M,J)=0.0
      IF(V0(PL+M,J)+R0579X(M,J).LT..01) V(PL+M,J)=0.0
 4051 CONTINUE
      DO 4052 I=1,3
      IF(V0(PAJ+I,J)+R0571X(I,J).LT..01) V(PAJ+I,J)=0.0
 4052 CONTINUE
      IF(V0(PA4,J)+R0572X(J).LT..01) V(PA4,J)=0.0
      IF(V0(PA5,J)+R0573X(J).LT..01) V(PA5,J)=0.0
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      DO 5005 I=1,30
 5005 IF(AV(I,J).LT.0.0) AV(I,J)=0.0
      DO 5015 I=1,62
 5015 IF(V(I,J).LT.0.0) V(I,J)=0.0
      IF(JUMP) 6000,5000,7000
 5000 CONTINUE
C     CALCULATE COEFFICIENTS AND KINEMATIC EQUATIONS
      DO 5040 IB=1,2
      IR=3-IB
C***********************************************************************
C     FIRST EQUATION SET
C
C     AA(I) VERSUS AA(J)
C
C    *EQN (1-1) - SB(M) KINEMATIC
      DO 5017 M=1,MB
      QX1=((R0307P(1,M,IR)+R0307P(2,M,IR))*C0307X(M,1,IR)
     1  +R0327P(1,M,IR)*SQRT(1.0-P0105P(1,IB))*SQRT(1.0-P0109X(M,1,IB))
     2  *C0307X(M,2,IR)+(R0327P(2,M,IR)*SQRT(1.0-P0105P(2,IB))*SQRT(
     3  1.0-P0109X(M,2,IB))+R0327P(3,M,IR)*SQRT(1.0-P0105P(3,IB))*SQRT(
     4  1.0-P0109X(M,3,IB)))*C0307X(M,SWT2(IR),IR))
      DV(PSB+M,IB)=DIVIDE(QX1,V(PB+M,IB))-R0700X(M,IB)*SWITC(V(PSB+M,IB)
     1  )
C    *EQN (1-1A) - DEGRADATION FACTOR AT B(M)
      C0003P(M,IB)=EXP(-V(PSB+M,IB))
 5017 CONTINUE
C   -*EQN (1-1B) - A(I) LAUNCH RATE DEGRADATION
      DO 5018 J=1,JA
      C0004P(J,IB) = F0309X(J,1,IB)*C0003P(1,IB)
     1+F0309X(J,2,IB)*C0003P(2,IB)
 5018 CONTINUE
C    *EQN (1-1C) - TOTAL A(I) LAUNCH RATE
      R0001P(1,IB)=R0001X(1,IB)*V(PAJ+1,IB)*SWITCH(V(PA4,IB))*
     1C0004P(1,IB)
      N=2-SWT2(IB)
C     LAUNCH A2 AND A3
      R0001P(2,IB)=R0001X(2,IB)*V(PAJ+2,IB)*SWITCH(V(PA4+N,IB))*
     1C0004P(2,IB)
      R0001P(3,IB)=R0001X(3,IB)*V(PAJ+3,IB)*SWITCH(V(PA4+N,IB))*
     1C0004P(3,IB)
      DO 5030 I=1,JA
C    *EQN (1-2) - AA(I) LAUNCH RATE
      R0002P(I,IB) = R0001P(I,IB)*(1.0-F0001X(I,IB))
C    *EQN (1-3) - AG(I) LAUNCH RATE
      R0003P(I,IB) = R0001P(I,IB)*F0001X(I,IB)
 5030 CONTINUE
C    *EQN (1-4) - TOTAL LAUNCH RATE FOR ALL AIRCRAFT
      R0005P(IB) = R0001P(1,IB)+R0001P(2,IB)+R0001P(3,IB)
 5040 CONTINUE
      DO 5120 IB=1,2
      IR=3-IB
      DO 5100 J=1,JA
      DO 5060 I=1,JA
C    *EQN (1-5) SINGLE SHOT MISS PROBABILITY FOR AA(I) VS. AA(J)
      C0001P(I,J,IB) = 1.0-P0001X(I,J,IR)*P0002X(I,J,IR)
 5060 CONTINUE
C    *EQN (1-6) - DIRECT ATTRITION FOR AA VS. AA(J)
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      A0001P(J,IB) = R0002P(J,IB)*(1.0-C0001P(1,J,IB)**DIVIDE(R0002P(1,I
     $               R),R0005P(IB))*C0001P(2,J,IB)**DIVIDE(R0002P(2,IR),
     $               R0005P(IB))*C0001P(3,J,IB)**DIVIDE(R0002P(3,IR),R00
     $               05P(IB)))
C
C     AA(I) VS. AG(J)
      DO 5080 I=1,JA
C    *EQN (1-7) - SINGLE SHOT MISS PROBABILITY FOR AA(I) VS. AG(J)
      C0002P(I,J,IB) = 1.0-P0003X(I,J,IR)*P0004X(I,J,IR)
 5080 CONTINUE
C    *EQN (1-8) - ATTRITION OF AA VS. AG(J)
      A0002P(J,IB)=R0003P(J,IB)*(1.0-C0002P(1,J,IB)**DIVIDE(R0002P(1,IR)
     1 ,R0005P(IB))*C0002P(2,J,IB)**DIVIDE(R0002P(2,IR),R0005P(IB))
     2 *C0002P(3,J,IB)**DIVIDE(R0002P(3,IR),R0005P(IB)))
C    *EQN (1-9) - SURVIVAL RATE FOR AG(J)
      R0004P(J,IB) = R0003P(J,IB)-A0002P(J,IB)
 5100 CONTINUE
 5120 CONTINUE
      DO 5220 IB=1,2
      IR=3-IB
      DO 5200 J=1,JA
      DO 5140 I=1,IF
C
C*************************************************************************
C     SECOND EQUATION SET
C     GROUND DEFENSES AGAINST AG(J)
C
C     G1F DEFENSE
C    *EQN (2-1) - FRACTIONAL ALLOCATION OF AF(J) TO FRONT I
      QX1=A0401P(1,IB)+A0401P(2,IB)+A0401P(3,IB)
      F0101P(J,I,IB)=DIVIDE(A0401P(I,IB),QX1)
C    *EQN (2-2) - ACQUISITION FACTOR FOR AG(J) VS. G1F(I)
      P0101P(J,I,IB)=1.0-EXP(-ALPHA*C0211X(J,IB)*AV(PG1F+I,IB))
C    *EQN (2-3) - ACQUISITION FACTOR FOR AG(J) VS. G2F(I)
      QX1=AMAX1(V(PG2F+I,IR)-C0521X(IR)*V(PG1F+I,IR),0.0)
      DISG2(I,IR)=DIVIDE(QX1,V(PG2F+I,IR))
      P0102P(J,I,IB)=1.0-EXP(-ALPHA*C0212X(J,IB)*DISG2(I,IR)*AV(PG2F+I,
     1   IB))
C    *EQN (2-4) - ACQUISTION FACTOR FOR A(J)G VS. W(K)F(I)
      DO 5125 K=1,NW
      N=3*(K-1)+I
      P0111P(J,N,IB)=1.0-EXP(-ALPHA*C0216X(J,K,IB)*AV(PW+N,IB))
 5125 CONTINUE
C    *EQN (2-5) - FRACTIONAL ALLOCATION OF AIR BATTLE SURVIVORS TO G1F(I)
      F0103P(J,I,IB)=F0101X(J,IB)*F0101P(J,I,IB)*F0201X(J,I,IB)
C    *EQN (2-6) - KILL PROBABILITY FOR G1F(I) AD AGAINST AG(J)
      P0103P(I,J,IR) = 1.0-(1.0-P0103X(J,IR))**(F0102X(IR)*V(PG1F+I,IR))
C    *EQN (2-7) - DIRECT ATTRITION FOR G1F(I) VS. AG(J)
      A0101P(I,J,IB) = R0004P(J,IB)*F0103P(J,I,IB)*(1.0-(1.0-P0103P(I,J,
     $                 IR))*(1.0-P0101P(J,I,IB)*P0104X(J,IR)))
C
C     G2F DEFENSE
C
C    *EQN (2-9) - FRACTIONAL ALLOCATION OF AIR BATTLE SURVIVORS TO G2F(I)
      F0105P(J,I,IB)=F0101X(J,IB)*F0101P(J,I,IB)*F0202X(J,I,IB)
C    *EQN (2-10) - KILL PROBABILITY FOR G2F(I) AD AGAINST AG(J)
      P0104P(I,J,IR)=1.0-(1.0-P0103X(J,IR))**(F0103X(IR)*DISG2(I,IR)*
```

```
     1    V(PG2F+I,IR))
C     *EQN (2-11) - DIRECT ATTRITION  FOR G2FI ON AF(J)
      A0102P(I,J,IB) = R0004P(J,IB)*F0105P(J,I,IB)*(1,0-(1,0-P0104P(I,J,
     1    IR))*(1,0-P0102P(J,I,IB)*P0105X(J,IR)))
C
C      W(K)F DEFENSE
C
      DO 5130 K=1,NW
      N=3*(K-1)+I
C     *EQN (2-11,5A) - FRACTIONAL ALLOCATION OF AIR BATTLE SURVIVORS TO W(K)F
      F0112P(J,N,IB)=F0101X(J,IB)*F0101P(J,I,IB)*F0203X(J,N,IB)
C     *EQN (2-11,5B) - KILL PROBABILITY FOR W(K)F(I) AGAINST A(J)G
      P0112P(N,J,IR)=1,0-(1,0-P0103X(J,IR))**(F0110X(K,IR)*V(PW+N,IR))
C     *EQN (2-11,5C) - DIRECT ATTRITION FOR W(K)F(I) ON A(J)GF
      A0108P(N,J,IB)=R0004P(J,IB)*F0112P(J,N,IB)*(1,0-(1,0-
     1    P0112P(N,J,IR))*(1,0-P0111P(J,N,IB)*P0110X(K,J,IR)))
 5130 CONTINUE
 5140 CONTINUE
C
C      G1R DEFENSE
C
C     *EQN (2-12) - KILL PROBABILITY FOR REAR AGAINST AG(J)
      P0105P(J,IR) = 1,0-(1,0-P0103X(J,IR))**(F0109X(IR)*(V(PG1F+1,IR)+V
     $                (PG1F+2,IR)+V(PG1F+3,IR))/3,)
C     *EQN (2-13) - FRACTIONAL ALLOCATION OF AIR BATTLE SURVIVORS TO G1R
      F0106P(J,IB)= (1,0-F0101X(J,IB))*F0104X(J,IB)
C     *EQN (2-14) - ACQUISITION FACTOR FOR AGR(J)  AGAINST G1
      P0106P(J,IB)=1,0-EXP(-ALPHA*C0213X(J,IB)*AV(PG1R,IB))
C     *EQN (2-15) - DIRECT ATTRITION FOR G1R AGAINST AG(J)
      A0103P(J,IB) = R0004P(J,IB)*F0106P(J,IB)*(1,0-(1,0-P0105P(J,IR))*(
     $               1,0-P0106P(J,IB)*P0104X(J,IR)))
C
C      G2R DEFENSE
C
C     *EQN (2-16) FRACTIONAL ALLOCATION OF AIR BATTLE SURVIVORS TO G2R
      F0107P(J,IB) = (1,0-F0101X(J,IB))*F0105X(J,IB)
C     *EQN (2-17) - ACQUISITION FACTOR OF AG(J) AGAINST G2R
      QX1=AMAX1(V(PG2R,IR)-C0521X(IR)*V(PG1R,IR),0,0)
      DISG2(4,IR)=DIVIDE(QX1,V(PG2R,IR))
      P0108P(J,IB)=1,0-EXP(-ALPHA*C0214X(J,IB)*DISG2(4,IR)*AV(PG2R,IB))
C     *EQN (2-18) - DIRECT ATTRITION FOR G2R AGAINST AG(J)
      A0104P(J,IB) = R0004P(J,IB)*F0107P(J,IB)*(1,0-(1,0-P0105P(J,IR))*(
     $                1,0-P0108P(J,IB)*P0105X(J,IR)))
C
C      W(K)R DEFENSE
C
      DO 5150 K=1,NW
C     *EQN (2-18,5A) - FRACTIONAL ALLOCATION OF AIR BATTLE SURVIVORS TO W(K)R
      F0113P(J,K,IB)=(1,0-F0101X(J,IB))*F0111X(J,K,IB)
C     *EQN (2-18,5B) - ACQUISITION FACTOR FOR A(J)GR AGAINST W(K)R
      P0113P(J,K,IB)=1,0-EXP(-ALPHA*C0217X(J,K,IB)*AV(PWR+K,IB))
C     *EQN (2-18,5C) - DIRECT ATTRITION FOR W(K)R AGAINST A(J)GR
      A0109P(K,J,IB)=R0004P(J,IB)*F0113P(J,K,IB)*(1,0-(1,0-P0105P(J,IR))
     1    *(1,0-P0113P(J,K,IB)*P0110X(K,J,IR)))
 5150 CONTINUE
C
C      S DEFENSE
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C     *EQN (2-19) - FRACTIONAL ALLOCATION OF AIR BATTLE SURVIVORS TO S
       F0108P(J,IB) = (1.0-F0101X(J,IB))*F0106X(J,IB)
C     *EQN (2-21) DIRECT ATTRITION FOR S AGAINST AG(J)
       A0105P(J,IB) = R0004P(J,IB)*F0108P(J,IB)*(1.0-(1.0-P0105P(J,IR))
      1*(1.0-P0107X(J,IR)))
C
C      LAUNCHER DEFENSE
       DO 5160 L=1,LL
C     *EQN (2-22) - FRACTIONAL ALLOCATION OF AIR BATTLE SURVIVORS TO L(L)
       F0109P(J,L,IB) = (1.0-F0101X(J,IB))*F0107X(J,L,IB)
C     *EQN (2-23) - ACQUISITION FACTOR FOR AG(J) AGAINST L(L)
       P0110P(J,L,IB)=1.0-EXP(-ALPHA*C0215X(J,L,IB)*AV(PL+L,IB))
C     *EQN (2-24) - DIRECT ATTRITION FOR L(L) AGAINST AG(J)
       A0106P(L,J,IB) = R0004P(J,IB)*F0109P(J,L,IB)*(1.0-(1.0-P0105P(J,IR
      $                ))*(1.0-P0110P(J,L,IB)*P0108X(L,J,IR)))
 5160 CONTINUE
       DO 5180 M=1,MB
C
C      BASE AIR DEFENSES
C     *EQN (2-25) - FRACTIONAL ALLOCATION OF AIR BATTLE SURVIVORS TO B(M)
       F0110P(J,M,IB) = (1.0-F0101X(J,IB))*F0108X(J,M,IB)
C     *EQN (2-26) - DIRECT ATTRITION FOR B(M) AGAINST AG(J)
       A0107P(M,J,IB) = R0004P(J,IB)*F0110P(J,M,IB)*(1.0-(1.0-P0105P(J,IR
      1))*(1.0-P0109X(M,J,IR)))
 5180 CONTINUE
 5200 CONTINUE
 5220 CONTINUE
       DO 5420 IB=1,2
       IR=3-IB
       DO 5320 L=1,LL
       QQ=V(PL+L,IR)*R0301X(L,IR)*SWITCH(V(PM+L,IR))
C***********************************************************************
C      3A EQUATION SET
C      MISSILES VS. GROUND TARGETS
       DO 5240 I=1,IF
C
C      G1F GROUND TARGETS
C     *EQN (3-1) - FRACTIONAL ALLOCATION OF L(L) AGAINST G1F(I)
       F0301P(L,I,IR)=F0301X(L,IR)*F0302X(L,I,IR)
      1*F0303X(L,I,IR)
C     *EQN (3-2) - FLOW OF M(L) FROM REAR TO G1F(I)
       P0301P(L,I,IR)=1.0-EXP(-ALPHA*C0231X(L,IR)*AV(PG1F+I,IR))
       R0301P(L,I,IR)=QQ*F0301P(L,I,IR)*P0301P(L,I,IR)
C     *EQN (3-3) - ATTRITION FOR M(L) AGAINST G1F(I)
       A0301P(L,I,IB)= P0301X(L,IR)*R0301P(L,I,IR)
C
C      G2F GROUND TARGETS
C     *EQN (3-4) - FRACTIONAL ALLOCATION OF L(L) AGAINST G2F(I)
       F0302P(L,I,IR)=F0301X(L,IR)*F0302X(L,I,IR)*F0312X(L,I,IR)
C     *EQN (3-5) - FLOW OF M(L) FROM REAR TO G2F(I)
       P0302P(L,I,IR)=1.0-EXP(-ALPHA*C0232X(L,IR)*DISG2(I,IB)*AV(PG2F+I,
      1    IR))
       R0302P(L,I,IR)=QQ*F0302P(L,I,IR)*P0302P(L,I,IR)
C     *EQN (3-6) - ATTRITION FOR M(L) AGAINST G2F(I)
       A0302P(L,I,IB)= P0302X(L,IR)*R0302P(L,I,IR)
       DO 5230 K=1,NW
       N=3*(K-1)+I
```

```
C
C       W(K)F GROUND TARGETS
C      *EQN (3-6.5A) - FRACTIONAL ALLOCATION OF L(L)F(I) AGAINST W(K)F(I)
        F0308P(L,N,IR)=F0301X(L,IR)*F0302X(L,I,IR)*F0310X(L,N,IR)
C      *EQN (3-6.5B) - FLOW OF M(L) FROM REAR TO W(K)F(I)
        P0306P(L,N,IR)=1.0-EXP(-ALPHA*C0236X(L,K,IR)*AV(PW+N,IR))
        R0308P(L,N,IR)=QQ*F0308P(L,N,IR)*P0306P(L,N,IR)
C      *EQN (3-6.5C) - ATTRITION FOR M(L) AGAINST W(K)F(I)
        A0309P(L,N,IB)=P0308X(L,K,IR)*R0308P(L,N,IR)
 5230   CONTINUE
 5240   CONTINUE
C
C       G1R GROUND TARGETS
C      *EQN (3-7) - FRACTIONAL ALLOCATION OF L(L) TO G1R
        F0303P(L,IR)= (1.0-F0301X(L,IR))*F0304X(L,IR)
C      *EQN (3-8) - FLOW OF M(L) FROM REAR TO G1R
        P0303P(L,IR)=1.0-EXP(-ALPHA*C0233X(L,IR)*AV(PG1R,IR))
        R0303P(L,IR)=QQ*F0303P(L,IR)*P0303P(L,IR)
C      *EQN (3-9) - ATTRITION OF M(L) AGAINST G1R
        A0303P(L,IB)=P0303X(L,IR)*R0303P(L,IR)
C
C       G2R GROUND TARGETS
C      *EQN (3-10) - FRACTIONAL ALLOCATION OF L(L) TO G2R
        F0304P(L,IR)= (1.0-F0301X(L,IR))*F0305X(L,IR)
C      *EQN (3-11) - FLOW OF M(L) FROM REAR TO G2R
        P0304P(L,IR)=1.0-EXP(-ALPHA*C0234X(L,IR)*DISG2(4,IB)*AV(PG2R,IR))
        R0304P(L,IR)=QQ*F0304P(L,IR)*P0304P(L,IR)
C      *EQN (3-12) - ATTRITION OF M(L) AGAINST G2R
        A0304P(L,IB)= P0304X(L,IR)*R0304P(L,IR)
        DO 5250 K=1,NW
C
C       W(K)R GROUND TARGETS
C      *EQN (3-12.5A) - FRACTIONAL ALLOCATION OF L(L)R AGAINST W(K)R
        F0309P(L,K,IR)=(1.0-F0301X(L,IR))*F0311X(L,K,IR)
C      *EQN (3-12.5B) - FLOW OF M(L) FROM REAR TO W(K)R
        P0307P(L,K,IR)=1.0-EXP(-ALPHA*C0237X(L,K,IR)*AV(PWR+K,IR))
        R0309P(L,K,IR)=QQ*F0309P(L,K,IR)*P0307P(L,K,IR)
C      *EQN (3-12.5C) - ATTRITION FOR M(L) AGAINST W(K)R
        A0310P(L,K,IB)=P0309X(L,K,IR)*R0309P(L,K,IR)
 5250   CONTINUE
        DO 5260 K=1,LL
C
C       L(K) GROUND TARGETS
C      *EQN (3-13) - FRACTIONAL ALLOCATION OF M(L) AGAINST L(K)
        F0305P(L,K,IR)=(1.0-F0301X(L,IR))
       1*F0306X(L,K,IR)
C      *EQN (3-14) - FLOW OF M(L) FROM REAR TO L(K)
        P0305P(L,K,IR)=1.0-EXP(-ALPHA*C0235X(L,K,IR)*AV(PL+K,IR))
        R0305P(L,K,IR)=QQ*F0305P(L,K,IR)*P0305P(L,K,IR)
C      *EQN (3-15) - ATTRITION OF M(L) AGAINST L(K)
        A0305P(L,K,IB)= P0305X(L,K,IR)*R0305P(L,K,IR)
 5260   CONTINUE
C
C       S GROUND TARGETS
C      *EQN (3-16) - FRACTIONAL ALLOCATION OF L(L) TO S
        F0306P(L,IR) = (1.0-F0301X(L,IR))*F0307X(L,IR)
C      *EQN (3-17) - FLOW OF M(L) FROM REAR TO S
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      R0306P(L,IR)=QQ*F0306P(L,IR)
C     *EQN (3-18) - ATTRITION OF M(L) AGAINST S
      A0306P(L,IB)=P0306X(L,IR)*R0306P(L,IR)*SWITCH(V(PS,IB))
      DO 5280 M=1,MB
C
C     B(M) GROUND TARGETS
C     *EQN (3-19) - FRACTIONAL ALLOCATION OF L(L) AGAINST B(M)
      F0307P(L,M,IR)=(1.0-F0301X(L,IR))
     1*F0308X(L,M,IR)
C     *EQN (3-20) - FLOW OF M(L) TO B(M)
      R0307P(L,M,IR)=QQ*F0307P(L,M,IR)*DIVIDE(V(PB+M,IB),V0(PB+M,IB))
C     *EQN (3-21) - TOTAL AIRCRAFT ON B(M)
      V0301P(M,IB)=F0309X(1,M,IB)*V(PAJ+1,IB)+F0309X(2,M,IB)*V(PAJ+2,IB)
     1   +F0309X(3,M,IB)*V(PAJ+3,IB)
 5280 CONTINUE
      DO 5300 J=1,JA
C     *EQN (3-23) - ATTRITION FOR M(L) AGAINST AB(J,1)
      QX1=F0309X(J,1,IB)*V(PAJ+J,IB)*0.9
      A0307P(L,J,IB) = R0307P(L,1,IR)*P0307X(L,1,IR)
     1   *DIVIDE(QX1,V(PB+1,IB))
     3*SWITCH(V(PB+1,IB))
C     *EQN (3-24) - ATTRITION FOR M(L) AGAINST AB(J,2)
      QX1=F0309X(J,2,IB)*V(PAJ+J,IB)*0.9
      A0308P(L,J,IB) = R0307P(L,2,IR)*P0307X(L,2,IR)
     1   *DIVIDE(QX1,V(PB+2,IB))
     2*SWITCH(V(PB+2,IB))
 5300 CONTINUE
 5320 CONTINUE
      DO 5400 J=1,JA
C
C***************************************************************************
C     3B EQUATION SET
C     AIRCRAFT VS. GROUND TARGETS
      DO 5340 I=1,IF
C
C     AG(J) VS. G1F(I)
C     *EQN (3-25) - ATTRITION OF AG(J) AGAINST G1F(I)
      R0321P(J,I,IR) = R0004P(J,IR)*F0103P(J,I,IR)
      A0321P(J,I,IB) = R0321P(J,I,IR)
     1*SQRT(1.0-P0103P(I,J,IB))*P0101P(J,I,IR)
     2*SQRT(1.0-P0104X(J,IB))*P0101X(J,SWT2(IR),IR)
C
C     AG(J) VS. G2F(I)
C     *EQN (3-26) - ATTRITION OF AG(J) AGAINST G2F(I)
      R0322P(J,I,IR) = R0004P(J,IR)*F0105P(J,I,IR)
      A0322P(J,I,IB) = R0322P(J,I,IR)
     1*SQRT(1.0-P0104P(I,J,IB))*P0102P(J,I,IR)
     2*SQRT(1.0-P0105X(J,IB))*P0102X(J,SWT2(IR),IR)
      DO 5330 K=1,NW
      N=3*(K-1)+I
C
C     A(J)G VS. W(K)F(I)
C     *EQN (3-26.5) - ATTRITION OF A(J)G AGAINST W(K)F(I)
      R0328P(J,N,IR)=R0004P(J,IR)*F0112P(J,N,IR)
      A0329P(J,N,IB)=R0328P(J,N,IR)*SQRT(1.0-P0112P(N,J,IB))*
     1   P0111P(J,N,IR)*SQRT(1.0-P0110X(K,J,IB))*
     2   P0328X(J,K,2*(IR-1)+SWT2(IR))
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 5330 CONTINUE
 5340 CONTINUE
C
C       AG(J) VS. G1R
C      *EQN (3-27) - ATTRITION OF AG(J) AGAINST G1R
        R0323P(J,IR) = R0004P(J,IR)*F0106P(J,IR)
        A0323P(J,IB) = R0323P(J,IR)
       1*SQRT(1.0-P0105P(J,IB))*P0106P(J,IR)
       2*SQRT(1.0-P0104X(J,IB))*P0323X(J,SWT2(IR),IR)
C
C       AG(J) VS. G2R
C      *EQN (3-28) - ATTRITION OF AG(J) AGAINST G2R
        R0324P(J,IR) = R0004P(J,IR)*F0107P(J,IR)
        A0324P(J,IB) = R0324P(J,IR)
       1*SQRT(1.0-P0105P(J,IB))*P0108P(J,IR)
       2*SQRT(1.0-P0105X(J,IB))*P0324X(J,SWT2(IR),IR)
        DO 5350 K=1,NW
C
C       A(J)G VS. W(K)R
C      *EQN (3-28.5) - ATTRITION OF A(J)G AGAINST W(K)R
        R0329P(J,K,IR)=R0004P(J,IR)*F0113P(J,K,IR)
        A0330P(J,K,IB)=R0329P(J,K,IR)*SQRT(1.0-P0105P(J,IB))*
       1    P0113P(J,K,IB)*SQRT(1.0-P0110X(K,J,IB))*
       2    P0329X(J,K,2*(IR-1)+SWT2(IR))
 5350 CONTINUE
C
C       AG(J) VS. S
C      *EQN (3-29) - ATTRITION OF AG(J) AGAINST S
        R0325P(J,IR) = R0004P(J,IR)*F0108P(J,IR)
        A0325P(J,IB) = R0325P(J,IR)*SQRT(1.0-P0105P(J,IB))
       2*SQRT(1.0-P0107X(J,IB))*P0325X(J,SWT2(IR),IR)*SWITCH(V(PS+1,IB))
        DO 5360 L=1,LL
C
C       AG(J) VS. L(L)
C      *EQN (3-30) - ATTRITION OF AG(J) AGAINST L(L)
        R0326P(J,L,IR) = R0004P(J,IR)*F0109P(J,L,IR)
        A0326P(J,L,IB) = R0326P(J,L,IR)
       1*SQRT(1.0-P0105P(J,IB))*P0110P(J,L,IR)
       2*SQRT(1.0-P0108X(L,J,IB))*P0326X(J,L,(SWT2(IR)+(IR-1)*2))
 5360 CONTINUE
       DO 5370 M=1,MB
       R0327P(J,M,IR)=R0004P(J,IR)*F0110P(J,M,IR)
 5370 CONTINUE
       DO 5380 I=1,JA
C
C       AG(J) VS. B(M)
C      *EQN (3-31) - ATTRITION OF AG(J) AGAINST B(1)
        QX1=F0309X(I,1,IB)*V(PAJ+I,IB)*0.9
        A0327P(J,I,IB) = R0327P(J,1,IR)
       1*SQRT(1.0-P0105P(J,IB))*SQRT(1.0-P0109X(1,J,IB))
       2*P0327X(J,1,(SWT2(IR)+(IR-1)*2))
       3    *DIVIDE(QX1,V(PB+1,IB))
C      *EQN (3-32) - ATTRITION OF AG(J) AGAINST B(2)
        QX1=F0309X(I,2,IB)*V(PAJ+I,IB)*0.9
        A0328P(J,I,IB) = R0327P(J,2,IR)
       1*SQRT(1.0-P0105P(J,IB))*SQRT(1.0-P0109X(2,J,IB))
       2*P0327X(J,2,(SWT2(IR)+(IR-1)*2))
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     3    *DIVIDE(QX1,V(PB+2,IB))
 5380 CONTINUE
 5400 CONTINUE
 5420 CONTINUE
      DO 5460 IB=1,2
      IR=3-IB
      DO 5440 I=1,IF
C***********************************************************************
C     FOURTH EQUATION SET
C     GROUND TO GROUND INTERACTIONS
C
C     G1F VS. G1F
C    *EQN (4- 1) ATTRITION FOR G1F(I) AGAINST G1F(I)
      A0401P(I,IB)=P0401X(IR)*(1.0-EXP(-6.9 *V(PG2F+I,IR)/V(PG1F+I,IR)))
     1    *V(PG1F+I,IR)
      A0401P(I,IB)=AMIN1(A0401P(I,IB),V(PG1F+I,IB))
C    *EQN (4- 9) - ATTRITION FOR G6F(I) AGAINST G2F(I)
      DO 5430 K=1,NW
      N=3*(K-1)+I
C
C     W(K) VS. G1
C    *EQN (4-2) - FLOW OF R(K)F(I) FROM F(I) AGAINST G1F(I)
      P0402P(K,I,IR)=1.0-EXP(-ALPHA*C0242X(K,IR)*AV(PG1F+I,IR))
      R0402P(K,I,IR)=V(PW+N,IR)*R0402X(K,IR)*F0402X(K,IR)*
     1    SWITCH(V(PR+N,IR))*P0402P(K,I,IR)
C    *EQN (4-3) - ATTRITION FOR W(K)F(I) AGAINST G1F(I)
          A0402P(K,I,IB)=P0402X(K,IR)*R0402P(K,I,IR)
C
C     W(K) VS. G2
C    *EQN (4-4) - FLOW OF R(K)F(I) FROM F(I) AGAINST G2F(I)
      P0403P(K,I,IR)=1.0-EXP(-ALPHA*C0243X(K,IR)*DISG2(I,IB)*AV(PG2F+I,
     1    IR))
      R0403P(K,I,IR)=V(PW+N,IR)*R0402X(K,IR)*F0403X(K,IR)*
     1    SWITCH(V(PR+N,IR))*P0403P(K,I,IR)
C    *EQN (4-5) - ATTRITION FOR W(K)F(I) AGAINST G2F(I)
      A0403P(K,I,IB)=P0403X(K,IR)*R0403P(K,I,IR)
      DO 5425 J=1,NW
      NN=3*(J-1)+I
C
C     W(K) VS. W(J)F
C    *EQN (4-6) - FLOW OF R(K)F(I) FROM F(I) AGAINST W(J)F(I)
      P0404P(K,NN,IR)=1.0-EXP(-ALPHA*C0244X(K,J,IR)*AV(PW+NN,IR))
      R0404P(K,NN,IR)=V(PW+N,IR)*R0402X(K,IR)*F0404X(K,J,IR)*
     1    SWITCH(V(PR+N,IR))*P0404P(K,NN,IR)
C    *EQN (4-7) - ATTRITION FOR W(K)F(I) AGAINST W(J)F(I)
      A0404P(K,NN,IB)=P0404X(K,J,IR)*R0404P(K,NN,IR)
 5425 CONTINUE
 5430 CONTINUE
 5440 CONTINUE
 5460 CONTINUE
      DO 5580 IB=1,2
      IR=3-IB
C***********************************************************************
C     FIFTH EQUATION SET
C     FLOWS AND ASSOCIATED ATTRITION
      DO 5480 I=1,IF
C
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C      G1 ATTRITION
C     *EQN (5-1) - TOTAL G1F(I) ATTRITION
       A0501P(I,IB)= A0301P(1,I,IB)+A0301P(2,I,IB)
      1+A0321P(1,I,IB)+A0321P(2,I,IB)+A0321P(3,I,IB)+A0401P(I,IB)
       DO 5470 K=1,NW
       A0501P(I,IB)=A0501P(I,IB)+A0402P(K,I,IB)
 5470 CONTINUE
 5480 CONTINUE
       DO 5500 J=1,JA
C
C      AIRCRAFT ATTRITION
C     *EQN (5-2) - ATTRITION FOR AA AGAINST A(J)
       A0511P(J,IB)= A0001P(J,IB)+A0002P(J,IB)
C     *EQN (5-3) - TOTAL AGS(J) ATTRITION
       A0512P(J,IB)= A0101P(1,J,IB)+A0101P(2,J,IB)+A0101P(3,J,IB)
      1+A0102P(1,J,IB)+A0102P(2,J,IB)+A0102P(3,J,IB)+A0103P(J,IB)
      2+A0104P(J,IB)+A0105P(J,IB)+A0106P(1,J,IB)
      3+A0106P(2,J,IB)+A0107P(1,J,IB)+A0107P(2,J,IB)
       DO 5490 K=1,NW
       N=3*(K-1)
       A0512P(J,IB)=A0512P(J,IB)+A0108P(1+N,J,IB)+A0108P(2+N,J,IB)+
      1    A0108P(3+N,J,IB)+A0109P(K,J,IB)
 5490 CONTINUE
C     *EQN (5-4) - TOTAL AB(J) ATTRITION
       A0513P(J,IB)= A0307P(1,J,IB)+A0307P(2,J,IB)
      1+A0308P(1,J,IB)+A0308P(2,J,IB)+A0327P(1,J,IB)+A0327P(2,J,IB)
      2+A0327P(3,J,IB)+A0328P(1,J,IB)+A0328P(2,J,IB)+A0328P(3,J,IB)
C     *EQN (5-5) - TOTAL A(J) ATTRITION
       A0514P(J,IB)= A0511P(J,IB)+A0512P(J,IB)+A0513P(J,IB)
 5500 CONTINUE
       IF(SWT2(IB).EQ.2) GO TO 5510
C
C      A2 AND A3 USING A5
C
C      A4 ATTRITIONS AND EXPENDITURES
C     *EQN (5-6) - ASSOCIATED ATTRITION OF A4
       QX1=((V(PAJ+1,IB)+V(PAJ+2,IB)*(1.0-
      1    F0001X(2,IB))+V(PAJ+3,IB)*(1.0-F0001X(3,IB))))
       Q=DIVIDE(V(PA4,IB),QX1)
       A0515P(IB)=A0513P(1,IB)*AMIN1(Q,C0511X(IB))+A0513P(2,IB)*AMIN1(
      1    Q,C0512X(2,IB))+A0513P(3,IB)*AMIN1(Q,C0513X(2,IB))
C     *EQN (5-7) - EXPENDATURE OF A4
       E0511P(IB)=E0511X(IB)*(R0002P(1,IB)+R0002P(2,IB)+R0002P(3,IB))+
      1    E0512X(IB)*R0003P(1,IB)
C
C      A5 ATTRITIONS AND EXPENDITURES
C     *EQN (5-8) - ASSOCIATED ATTRITION OF A5
       QX1=((V(PAJ+2,IB)*
      1    F0001X(2,IB)+V(PAJ+3,IB)*F0001X(3,IB)))
       Q=DIVIDE(V(PA5,IB),QX1)
       A0516P(IB)=A0513P(2,IB)*AMIN1(Q,C0512X(1,IB))+A0513P(3,IB)*
      1    AMIN1(C0513X(1,IB),Q)
C     *EQN (5-9) - EXPENDATURE OF A5
       E0512P(IB)=E0513X(SWT2(IB),IB)*R0003P(2,IB)+E0514X(SWT2(IB),IB)
      1    *R0003P(3,IB)
       GO TO 5511
C
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```
C       A2 AND A3 USING A4
C
C       A4 ATTRITIONS AND EXPENDITURES
C      *EQN (5-6A) - ASSOCIATED ATTRITION OF A4
 5510 CONTINUE
        QX1=V(PAJ+1,IB)+V(PAJ+2,IB)+V(PAJ+3,IB)
        Q=DIVIDE(V(PA4,IB),QX1)
        A0515P(IB)=A0513P(1,IB)*AMIN1(Q,C0511X(IB))+A0513P(2,IB)*AMIN1(
       1    Q,C0512X(2,IB))+A0513P(3,IB)*AMIN1(Q,C0513X(2,IB))
C      *EQN (5-7A) - EXPENDITURE OF A4
        E0511P(IB)=E0511X(IB)*(R0002P(1,IB)+R0002P(2,IB)+R0002P(3,IB))+
       1    E0512X(IB)*R0003P(1,IB)+E0513X(SWT2(IB),IB)*R0003P(2,IB)+
       2    E0514X(SWT2(IB),IB)*R0003P(3,IB)
C
C       A5 ATTRITIONS AND EXPENDITURES
C      *EQN (5-8A) - ASSOCIATED ATTRITION OF A5
        A0516P(IB)=0.0
C      *EQN (5-9A) - EXPENDITURE OF A5
        E0512P(IB)=0.0
 5511 CONTINUE
        DO 5520 I=1,IF
C
C       G2F ATTRITIONS AND EXPENDITURES
C      *EQN (5-10) - TOTAL ATTRITION FOR G2F(I)
        A0521P(I,IB) = A0302P(1,I,IB)+A0302P(2,I,IB)+A0322P(1,I,IB)+A0322P
       1    (2,I,IB)+A0322P(3,I,IB)
        DO 5515 K=1,NW
        A0521P(I,IB)=A0521P(I,IB)+A0403P(K,I,IB)
 5515 CONTINUE
C      *EQN (5-11) - ASSOCIATED ATTRITION FOR G2
        QX1=AMIN1(C0521X(IB)*V(PG1F+I,IB),V(PG2F+I,IB))
        A0522P(I,IB)=A0501P(I,IB)*DIVFIX(QX1,V(PG1F+I,IB))
C      *EQN (5-12) - EXPENDITURE OF G2
        E0521P(I,IB)=E0521X(IB)*V(PG1F+I,IB)
       1    *(1.0-EXP(-6.9*V(PG2F+I,IB)/V(PG1F+I,IB)))
 5520 CONTINUE
C
C       G1R ATTRITIONS
C      *EQN (5-13) - TOTAL ATTRITION FOR G1R
        A0531P(IB)= A0303P(1,IB)+A0303P(2,IB)
       1+A0323P(1,IB)+A0323P(2,IB)+A0323P(3,IB)
C
C       G2R ATTRITIONS
C      *EQN (5-14) - TOTAL ATTRITION FOR G2R
        A0532P(IB)= A0304P(1,IB)+A0304P(2,IB)
       1+A0324P(1,IB)+A0324P(2,IB)+A0324P(3,IB)
C      *EQN (5-15) - ASSOCIATED ATTRITION FOR G2R
        QX1=AMIN1(C0521X(IB)*V(PG1R,IB),V(PG2R,IB))
        A0533P(IB)=A0531P(IB)*DIVFIX(QX1,V(PG1R,IB))
C
C       S ATTRITIONS
C      *EQN (5-15A) - TOTAL S ATTRITION
        A0540P(IB) = A0306P(1,IB)+A0306P(2,IB)+A0325P(1,IB)+A0325P(2,IB)
       1                  +A0325P(3,IB)
        DO 5540 L=1,LL
C
C       L(L) ATTRITION
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C     *EQN (5-16) - TOTAL L(L) ATTRITION
       A0541P(L,IB)= A0305P(1,L,IB)+A0305P(2,L,IB)
      1+A0326P(1,L,IB)+A0326P(2,L,IB)+A0326P(3,L,IB)
C
C      M(L) ATTRITIONS AND FLOWS
C
C     *EQN (5-17A) - NUMBER OF M(L) PER LAUNCHER
       X=DIVFIX(V(PM+L,IB),V(PL+L,IB))
       V0541P(L,IB)=AMIN1(V0541X(L,IB),X)
C
C     *EQN (5-17B) - NUMBER OF M(L) IN SITES
       V0542P(L,IB) = V(PM+L,IB)-V0541P(L,IB)*V(PL+L,IB)
C     *EQN (5-17C) - NUMBER OF M(L) IN TRANSIT
       V0545P(L,IB)=AMIN1(V0542P(L,IB),V0545X(L,IB))
C
C     *EQN (5-18A) - L(L) ASSOCIATED ATTRITION OF M(L)
       A0542P(L,IB) = V0541P(L,IB)*A0541P(L,IB)
C
C     *EQN (5-18B) - S ASSOCIATED ATTRITION OF M(L)
       V0542P(L,IB)=V0542P(L,IB)-V0545P(L,IB)
       A0543P(L,IB)=V0542P(L,IB)*DIVFIX(A0540P(IB),V(PS,IB))
C     *EQN (5-19) - TOTAL FLOW FOR M(L)
       R0541P(L,IB)= R0301P(L,1,IB)+R0301P(L,2,IB)+R0301P(L,3,IB)
      1+R0302P(L,1,IB)+R0302P(L,2,IB)+R0302P(L,3,IB)+R0303P(L,IB)
      2+R0304P(L,IB)+R0305P(L,1,IB)+R0305P(L,2,IB)+R0306P(L,IB)
      3+R0307P(L,1,IB)+R0307P(L,2,IB)
       DO 5530 K=1,NW
       N=3*(K-1)
       R0541P(L,IB)=R0541P(L,IB)+R0308P(L,1+N,IB)+R0308P(L,2+N,IB)+
      1   R0308P(L,3+N,IB)+R0309P(L,K,IB)
 5530 CONTINUE
C     *EQN (5-19A) - ASSOCIATED ATTRITION G2R ON M(L)
       QX1=1.0
       A0544P(L,IB)=V0545P(L,IB)*A0532P(IB)*DIVFIX(QX1,V(PG2R,IB))
 5540 CONTINUE
       DO 5560 K=1,NW
       DO 5558 I=1,IF
       N=3*(K-1)+I
C
C      W(K)F ATTRITIONS
C     *EQN (5-20) -TOTAL DIRECT W(K)F(I) ATTRITIONS
       A0502P(K,I,IB)=A0309P(1,N,IB)+A0309P(2,N,IB)+A0329P(1,N,IB)+
      1   A0329P(2,N,IB)+A0329P(3,N,IB)
       DO 5550 J=1,NW
       A0502P(K,I,IB)=A0502P(K,I,IB)+A0404P(J,N,IB)
 5550 CONTINUE
C     *EQN (5-21) - G1F ASSOCIATED ATTRITIONS OF W(K)F(I)
       QX1=AMIN1(C0523X(K,IB)*V(PG1F+I,IB),V(PW+N,IB))
       A0523P(K,I,IB)=A0501P(I,IB)*DIVFIX(QX1,V(PG1F+I,IB))
C
C      R(K)F ATTRITIONS AND EXPENDITURES
C     *EQN (5-22) - NUMBER OF R(K)F(I) PER W(K)F(I)
       V0546P(K,I,IB)=AMIN1(C0610X(K,IB),DIVFIX(V(PR+N,IB),V(PW+N,IB)))
C     *EQN (5-23) - NUMBER OF R(K)F(I) ASSOCIATED WITH G2F(I)
       V0548P(K,I,IB)=V(PR+N,IB)-V0546P(K,I,IB)*V(PW+N,IB)
C     *EQN (5-24) - W(K)F ASSOCIATED ATTRITIONS OF R(K)F(I)
       A0571P(K,I,IB)=(A0523P(K,I,IB)+A0502P(K,I,IB))*V0546P(K,I,IB)
```

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C     *EQN (5-25) - G2F ASSOCIATED ATTRITIONS OF R(K) F(I)
      A0551P(K,I,IB)=(A0521P(I,IB)+A0522P(I,IB))*DIVFIX(V0548P(K,I,IB),
     1    V(PG2F+I,IB))
C     *EQN (5-26) - R(K)F(I) EXPENDITURES
      E0551P(K,I,IB)=R0402P(K,I,IB)+R0403P(K,I,IB)
      DO 5555 J=1,NW
      E0551P(K,I,IB)=E0551P(K,I,IB)+R0404P(K,3*(J-1)+I,IB)
 5555 CONTINUE
 5558 CONTINUE
C
C     W(K)R ATTRITIONS
C     *EQN (5-27) - TOTAL DIRECT W(K)R ATTRITION
      A0503P(K,IB)=A0330P(1,K,IB)+A0330P(2,K,IB)+A0330P(3,K,IB)+
     1    A0310P(1,K,IB)+A0310P(2,K,IB)
C     *EQN (5-28) - G1R ASSOCIATED ATTRITIONS OF W(K)R
      QX1=AMIN1(C0523X(K,IB)*V(PG1R,IB),V(PWR+K,IB))
      A0534P(K,IB)=A0531P(IB)*DIVFIX(QX1,V(PG1R,IB))
C
C     R(K)R ATTRITIONS
C     *EQN (5-29) - NUMBER OF R(K) PER W(K)R
      V0547P(K,IB)=AMIN1(C0610X(K,IB),DIVFIX(V(PRR+K,IB),V(PWR+K,IB)))
C     *EQN (5-30) - NUMBER OF R(K) IN TRANSIT
      V0549P(K,IB)=AMIN1(V(PRR+K,IB)-V0547P(K,IB)*V(PWR+K,IB),
     1    V0551X(K,IB))
C     *EQN (5-31) - NUMBER OF R(K) IN SITES
      V0550P(K,IB)=V(PRR+K,IB)-V0549P(K,IB)-V0547P(K,IB)*V(PWR+K,IB)
C     *EQN (5-32) - W(K)R ASSOCIATED ATTRITIONS OF R(K)R
      A0572P(K,IB)=(A0503P(K,IB)+A0534P(K,IB))*V0547P(K,IB)
C     *EQN (5-33) - G2R ASSOCIATED ATTRITIONS OF R(K)R
      A0561P(K,IB)=(A0533P(IB)+A0532P(IB))*DIVFIX(V0549P(K,IB),
     1    V(PG2R,IB))
C     *EQN (5-34) - S ASSOCIATED ATTRITIONS OF R(K)R
      A0573P(K,IB)=A0540P(IB)*DIVFIX(V0550P(K,IB),V(PS,IB))
 5560 CONTINUE
C
C     RESUPPLY RATES
C     *EQN (5-35) - RESUPPLY RATES
      DO 5565 J=1,JA
      R0571P(J,IB) = R0571X(J,IB)
 5565 CONTINUE
      R0572P(IB)=R0572X(IB)
      R0573P(IB)= R0573X(IB)
      R0574P(IB) = R0574X(IB)
      R0575P(IB) = R0575X(IB)
      DO 5568 K=1,NW
      R0576P(K,IB)=R0576X(K,IB)
      R0577P(K,IB)=R0577X(K,IB)
 5568 CONTINUE
      DO 5570 L=1,LL
      R0578P(L,IB) = R0578X(L,IB)
      R0579P(L,IB) = R0579X(L,IB)
 5570 CONTINUE
 5580 CONTINUE
      DO 5800 IB=1,2
      IR=3-IB
C
C*************************************************************************
```

```
C      KINEMATIC EQUATIONS *** AT LONG LAST ***
       DO 5660 I=1,IF
C
C      F MOVEMENT
C     *EQN (6-1) - R(I)
       Q=V(PG1F+I,IB)*A0501P(I,IR)
       QQ=V(PG1F+I,IR)*A0501P(I,IB)
       QX1=Q-QQ
       QX2=Q+QQ
       C0601P(I,IB)=DIVIDE(QX1,QX2)
       IF((C0601P(I,IB).NE.0.0).OR.(V(PG1F+I,IB)*A0501P(I,IR).NE.0.0))
      1   GO TO 5640
       IF(V(PG1F+I,IB)-V(PG1F+I,IR)) 5600,5640,5620
 5600  CONTINUE
       C0601P(I,IB)= -1.0
       GO TO 5640
 5620  CONTINUE
       C0601P(I,IB)= 1.0
 5640  CONTINUE
C     *EQN (6-2) - KINEMATIC FOR XF(I)
       DV(PXF+I,IB) = R0601X*C0601P(I,IB)*(C0601X+(1.-C0601X)*C0601P(I,IB
      1)**4)
 5660  CONTINUE
       DO 5680 J=1,JA
C
C      A(J) MOVEMENT
C     *EQN (6-3) - KINEMATIC FOR A(J)
       DV(PAJ+J,IB)=R0571P(J,IB)-A0514P(J,IB)
 5680  CONTINUE
C     *EQN (6-4) - KINEMATIC FOR A4
       DV(PA4,IB)=R0572P(IB)-E0511P(IB)-A0515P(IB)
C     *EQN (6-5) - KINEMATIC FOR A5
       DV(PA5,IB)=R0573P(IB)-E0512P(IB)-A0516P(IB)
C
C      G1F MOVEMENT
C     *EQN (6-6) - G1F1 DEMAND FUNCTION
       Q=V0601X(1,IB)-V(PG1F+1,IB)
       QQ=F0601X(1,IB)*R0601X-DV(PXF+1,IB)
       QX=C0605X(IB)*Q*R0602X(IB)*QQ
       IF (Q .LT. 0.0 .AND. QQ .LT. 0.0) QX=-QX
       D0601P(1,IB)=QX+C0603X(1,IB)*A0501P(1,IB)
       DO 5700 I=2,IF
C     *EQN (6-7) - G1F2 G1F3 DEMAND FUNCTION
       Q=V0601X(I,IB)-V(PG1F+I,IB)
       QQ=F0601X(I,IB)*DV(PXF+1,IB)-DV(PXF+I,IB)
       QX=C0605X(IB)*Q*R0602X(IB)*QQ
       IF (Q .LT. 0.0 .AND. QQ .LT. 0.0) QX=-QX
       D0601P(I,IB)=QX+C0603X(I,IB)*A0501P(I,IB)
 5700  CONTINUE
       DO 5720 I=1,IF
C     *EQN (6-8) - FLOW OF G1R TO F(I)
       QX1=-C0604X(IB)*SWITC(D0601P(I,IB))*D0601P(I,IB)
       QX2=R0602X(IB)*V(PG1R,IB)
       Q=DIVIDE(QX1,QX2)
       QX1=-D0601P(I,IB)
       R0601P(I,IB)=R0602X(IB)*(V(PG1R,IB)*(1.0-EXP(Q))-SWITC(QX1)*
      1   V(PG1F+I,IB))
```

```
C     *EQN (6-9) - KINEMATIC FOR G1F(I)
       DV(PG1F+I,IB)=R0601P(I,IB)-A0501P(I,IB)
       OFLOW=0.0
       IF(R0601P(I,IB).LT.0) OFLOW=R0601P(I,IB)
       DAV(PG1F+I,IR)=C0251X(IR)*(V(PG1F+I,IB)-AV(PG1F+I,IR))-C0261X(IR)*
     1    AV(PG1F+I,IR)-A0501P(I,IB)+OFLOW*DIVIDE(AV(PG1F+I,IR),
     2    V(PG1F+I,IB))
C     *EQN (6-10) - G2F(I) DEMAND FUNCTION
       V0601P(I,IB)=V(PG1F+I,IB)*C0522X(IB)
       D0602P(I,IB)=(V0601P(I,IB)-V(PG2F+I,IB))*R0603X(IB)+C0607X(IB)*
     1    (A0521P(I,IB)+E0521P(I,IB)-AMAX1(0.0,1.0-C0521X(IB))*
     2    A0501P(I,IB))
C
C      G2F MOVEMENT
C     *EQN (6-11) - FLOW OF G2R TO F(I)
       QX1=-C0604X(IB)*SWITC(D0602P(I,IB))*D0602P(I,IB)
       QX2=R0603X(IB)*V(PG2R,IB)
       Q=DIVIDE(QX1,QX2)
       QX1=R0601P(I,IB)*V(PG2R,IB)
       X=SWITC(QX1)
       QX1=-D0602P(I,IB)
       QX2=-R0601P(I,IB)
       R0602P(I,IB)=R0603X(IB)*(V(PG2R,IB)*(1.0-EXP(Q))-SWITC(QX1)*
     1    V(PG2F+I,IB))+R0601P(I,IB)*(C0606X(IB)*X+DIVFIX(V(PG2F+I,IB),
     1    V(PG1F+I,IB))*SWITC(QX2))
C     *EQN (6-12) - KINEMATIC FOR G2F(I)
       DV(PG2F+I,IB)=R0602P(I,IB)-E0521P(I,IB)-A0522P(I,IB)-A0521P(I,IB)
       OFLOW=0.0
       IF(R0602P(I,IB).LT.0) OFLOW=R0602P(I,IB)
       DAV(PG2F+I,IR)=C0252X(IR)*(V(PG2F+I,IB)-AV(PG2F+I,IR))-C0262X(IR)*
     1    AV(PG2F+I,IR)-A0521P(I,IB)-(E0521P(I,IB)+A0522P(I,IR)-OFLOW)*
     2    DIVIDE(AV(PG2F+I,IR),V(PG2F+I,IB))
 5720 CONTINUE
C
C      G1R MOVEMENT
C     *EQN (6-13) - G1R KINEMATIC
       DV(PG1R,IB)=R0574P(IB)-R0601P(1,IB)-R0601P(2,IB)-R0601P(3,IB)-
     1    A0531P(IB)
       OFLOW=0.0
       IF((R0601P(1,IB)+R0601P(2,IB)+R0601P(3,IB)).GT.0) OFLOW=
     1    R0601P(1,IB)+R0601P(2,IB)+R0601P(3,IB)
       DAV(PG1R,IR)=C0253X(IR)*(V(PG1R,IB)-AV(PG1R,IR))-C0263X(IR)*
     1    AV(PG1R,IR)-A0531P(IB)-OFLOW*DIVIDE(AV(PG1R,IR),V(PG1R,IB))
C
C      G2R MOVEMENT
C     *EQN (6-14) - G2R KINEMATIC
       DV(PG2R,IB)=R0575P(IB)-R0602P(1,IB)-R0602P(2,IB)-R0602P(3,IB)-
     1    A0533P(IB)-A0532P(IB)
       OFLOW=0.0
       IF((R0602P(1,IB)+R0602P(2,IB)+R0602P(3,IB)).GT.0) OFLOW=
     1    R0602P(1,IB)+R0602P(2,IB)+R0602P(3,IB)
       DAV(PG2R,IR)=C0254X(IR)*(V(PG2R,IB)-AV(PG2R,IR))-C0264X(IR)*
     1    AV(PG2R,IR)-A0532P(IB)-(A0533P(IB)+OFLOW)*DIVIDE(AV(PG2R,IR),
     2    V(PG2R,IB))
       DO 5740 L=1,LL
C
C      M(L) MOVEMENT
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```
C     *EQN (6-15) - M(L) KINEMATIC
       DV(PM+L,IB)=R0578P(L,IB)-R0541P(L,IB)-A0542P(L,IB)-A0543P(L,IB)-
      1   A0544P(L,IB)
C
C      L(L) MOVEMENT
C     *EQN (6-16) - L(L) KINEMATIC
       DV(PL+L,IB)=R0579P(L,IB)-A0541P(L,IB)
       DAV(PL+L,IR)=C0255X(L,IR)*(V(PL+L,IB)-AV(PL+L,IR))-C0265X(L,IR)*
      1   AV(PL+L,IR)-A0541P(L,IB)
 5740 CONTINUE
       DO 5760 M=1,MB
C
C      B(M) MOVEMENT
C     *EQN (6-17) - B(M) KINEMATIC
       DV(PB+M,IB)=0.0
 5760 CONTINUE
       DO 5780 K=1,NW
       DO 5770 I=1,IF
       N=3*(K-1)+I
C
C      W(K)F(I) MOVEMENT
C     *EQN (6-18) - W(K)F(I) DEMAND FUNCTION
       V0602P(K,I,IB)=V0602X(K,I,IB)
       D0603P(K,I,IB)=(V0602P(K,I,IB)-V(PW+N,IB))*R0604X(K,IB)+
      1   C0611X(K,IB)*A0502P(K,I,IB)
C     *EQN (6-19) - FLOW OF W(K)R TO F(I)
       QR=AMAX1(V(PWR+K,IB)-FLOWAD(K,IB)*V(PG1R,IB),0.0)
       QF=AMAX1(V(PW+N,IB)-FLOWAD(K,IB)*V(PG1F+I,IB),0.0)
       QA=V(PW+N,IB)-QF
       QX1=-C0604X(IB)*SWITC(D0603P(K,I,IB))*D0603P(K,I,IB)
       QX3=R0604X(K,IB)*QR
       Q=DIVIDE(QX1,QX3)
       QX1=R0601P(I,IB)*V(PWR+K,IB)
       X=SWITC(QX1)
       QX1=-D0603P(K,I,IB)
       QX2=-R0601P(I,IB)
       R0603P(K,I,IB)=QX3*(1.0-EXP(Q))-R0604X(K,IB)*SWITC(QX1)*
      1   QF +R0601P(I,IB)*(FLOWAD(K,IB)*X+DIVFIX(QA,V(PG1F+I,IB))*
      2   SWITC(QX2))
C     *EQN (6-20) - W(K)F(J) KINEMATIC
       DV(PW+N,IB)=R0603P(K,I,IB)-A0502P(K,I,IB)-A0523P(K,I,IB)
       OFLOW=0.0
       IF(R0603P(K,I,IB).LT.0.0) OFLOW=R0603P(K,I,IB)
       DAV(PW+N,IR)=C0256X(K,IR)*(V(PW+N,IB)-AV(PW+N,IR))-C0266X(K,IR)*
      1   AV(PW+N,IR)-A0502P(K,I,IB)-DIVIDE(AV(PW+N,IB),V(PW+N,IB))*
      2   (A0523P(K,I,IB)-OFLOW)
C
C      R(K)F(I) - MOVEMENT
C     *EQN (6-21) - R(K)F(I) DEMAND FUNCTION
       V0603P(K,I,IB)=C0610X(K,IB)*V(PW+N,IB)
       D0604P(K,I,IB)=(V0603P(K,I,IB)-V(PR+N,IB))*R0605X(K,IB)+
      1   C0612X(K,IB)*E0551P(K,I,IB)
C     *EQN (6-22) - FLOW OF R(K)R TO F(I)
       QX1=-C0604X(IB)*SWITC(D0604P(K,I,IB))*D0604P(K,I,IB)
       QX2=R0605X(K,IB)*V(PRR+K,IB)
       Q=DIVIDE(QX1,QX2)
       QX1=R0603P(K,I,IB)*V(PRR+K,IB)
```

```
      X=SWITC(QX1)
      QX1=-D0604P(K,I,IB)
      QX2=-R0603P(K,I,IB)
      QY1=DIVFIX(V(PR+N,IB),V(PW+N,IB))
      Y=AMIN1(C0610X(K,IB),QY1)
      R0604P(K,I,IB)=R0605X(K,IB)*(V(PRR+K,IB)*(1.0-EXP(Q))-SWITC(QX1)*
     1   V(PR+N,IB))+R0603P(K,I,IB)*(C0610X(K,IB)*X+Y*SWITC(QX2))
C     *EQN (6-23) - R(K)F(I) KINEMATIC
      DV(PR+N,IB)=R0604P(K,I,IB)-E0551P(K,I,IB)-A0551P(K,I,IB)-
     1   A0571P(K,1,IB)
 5770 CONTINUE
C
C      W(K)R MOVEMENT
C     *EQN (6-24) - W(K)R KINEMATIC
      DV(PWR+K,IB)=R0576P(K,IB)-R0603P(K,1,IB)-R0603P(K,2,IB)-
     1   R0603P(K,3,IB)-A0503P(K,IB)-A0534P(K,IB)
      DFLOW=AMAX1(0.0,R0603P(K,1,IB)+R0603P(K,2,IB)+R0603P(K,3,IB))
      DAV(PWR+K,IR)=C0257X(K,IR)*(V(PWR+K,IB)-AV(PWR+K,IR))-C0267X(K,IR)
     1   *AV(PWR+K,IR)-A0503P(K,IB)-DIVIDE(AV(PWR+K,IR),V(PWR+K,IB))*
     2   (A0534P(K,IB)+DFLOW)
C
C      R(K)R MOVEMENT
C     *EQN (6-25) - R(K)R KINEMATIC
      DV(PRR+K,IB)=R0577P(K,IB)-R0604P(K,1,IB)-R0604P(K,2,IB)-
     1   R0604P(K,3,IB)-A0561P(K,IB)-A0572P(K,IB)-A0573P(K,IB)
 5780 CONTINUE
C
C      S MOVEMENT
C     *EQN (6-26) - S KINEMATIC
      DV(PS,IB)=-A0540P(IB)
 5800 CONTINUE
      GO TO 4100
 6000 CONTINUE
C      ERROR PROCESSING
      WRITE(6,600)
      STOP 2
 7000 CONTINUE
      MODFLG = .FALSE.
      IF (TIME.GE.TEND) GO TO 7150
      IF (ABS (TIME-TOUTER)  .LT. 1.0E-6) TIME = TOUTER
      IF (TIME.LT.TOUTER) GO TO 7150
C     *WE'RE AT A MODIFY POINT: PROCESS MODIFY CARDS.
      NLINES = 0
 7080 DO 7100 I = 1,4
      IF (INDEX(I).EQ.0) GO TO 7100
      IF (INDEX(I).GT.0) GO TO 7095
C     *CHANGING DATA POINT INTERVAL: FORCE A DATA POINT NOW
      TOUT = TIME
      DTINER = VAL(I)
      WRITE(6,601) VAL(I)
      GO TO 7100
 7095 CONTINUE
C     *CHANGING THE VALUE OF A COEFFICIENT
      K=INDEX(I)
      IF(K.GT.1682) GO TO 7100
      XCOFF(K) = VAL(I)
      CALL LCHPTR(1H ,TIT4,30,DATE,NLINES,-55)
```

```
      IF (NLINES.EQ.2) WRITE(6,208) TIME
      WRITE (6,209) K,XNAME(K),ELEMNT(K),VAL(I)
C     *IF THIS IS A VOCOEFFICIENT, ALSO RESET THE CORRESPONDING V  VARIABLE
      IF(K.GT.1552) PV(K-1552) = VAL(I)
 7100 CONTINUE
C     *CHECK NEXT MODIFY CARD
      READ (5,104) CARD
      IF (EOF(5)) 7110,7120
 7110 TOUTER = TEND
      DO 7115 I=1,4
 7115 INDEX(I) = 0
      GO TO 7145
 7120 IF(CARD(1).EQ.TYPE) GO TO 7140
      WRITE(6,302) CARD
      WRITE (6,301) TYPE
      STOP
 7140 DECODE(70,401,CARD(2)) T,(INDEX(I),VAL(I),I=1,4)
      IF(T.LE.TIME) GO TO 7080
C     *WE'VE FINISHED ALL MODIFICATIONS FOR THIS TIME POINT.
      TOUTER = T
C     *SEE IF THIS IS A DATA POINT
 7145 IF(TIME.LT.TOUT) GO TO 3000
      MODFLG = .TRUE.
 7150 CONTINUE
C     *WE'RE AT A DATA POINT: WRITE OUT MODEL STATE AND SET NEXT DATA PT.
      WRITE(3) TIME,(XCOEF(I),I=1,NXC), (PV(I), I=1,NV),
     +(PDV(I),I=1,NDV), SWT2(1), SWT2(2)
      IF(TIME.GT.TEND) GO TO 8000
      TOUT=TOUT+DTINER
      IF(TOUT.GT.TEND) TOUT=TEND
      IF(MODFLG) GO TO 3000
      GO TO 4000
 8000 CONTINUE
C     END PROCESSING
      STOP1
  104 FORMAT (8A10)
  208 FORMAT (//* PARAMETERS MODIFIED AT TIME = *,F10.5//)
  209 FORMAT(10X,*XCOEFF(*,I4,*) = *,2A10,* = *E15.6)
  301 FORMAT(//1X,5H*****,* ABOVE CARD MISPLACED OR UNIDENTIFIABLE*,
     1    5X,*EXPECTED CARD TYPE *,A10)
  302 FORMAT (//5X,8A10)
  401 FORMAT (F10.0,4(I5,F10.0))
  600 FORMAT(* PROCESSING ERROR*)
  601 FORMAT(1X/10X,*NEW TIME INTERVAL =*,F12.5/)
      END
```

```
      FUNCTION DIVIDE(X,Y)
C THIS IS THE DIVIDE FUNCTION USED TO AVOID DIVISION OF OR BY NUMBERS
C VERY CLOSE TO ZERO.
      DIVIDE=0.0
      IF((ABS(Y).LE.1.E-50).OR.(ABS(X).LE.1.E-50)) RETURN
      DIVIDE=X/Y
      RETURN
      END
```

```
      FUNCTION DIVFIX (X,Y)
C     SCALING FUNCTION FOR RESOURCE ALLOCATION
      IF (Y.LE.1.) DIVFIX = X*Y
      IF (Y.GT.1.) DIVFIX=X/Y
      RETURN
      END
```

```
      FUNCTION SWITC(X)
C  THIS FUNCTION PROVIDES EXPONENTIAL RATHER THAN
C  LINEAR EXPENDITURE OF COMMODITIES.
      DATA BETA/7.0/
      SWITC=0.0
      IF(X.LE.0.0) RETURN
      SWITC=1.0
      IF(X.GT.10.0) RETURN
      SWITC=1.0-EXP(-BETA*X)
      RETURN
      END
```

```
      FUNCTION SWITCH(X)
C   THIS FUNCTION PROVIDES EXPONENTIAL RATHER THAN
C   LINEAR EXPENDITURE OF COMMODITIES. IT DIFFERS
C   FROM SWITC ONLY BY SCALING FACTORS.
      DATA BETA/0.07/
      SWITCH = 0.0
      IF (X.LE.0.0) RETURN
      SWITCH=1.0
      IF(X.GT.1000.0) RETURN
      SWITCH = 1.0-EXP(-BETA*X)
      RETURN
      END
```

```
      SUBROUTINE INTEG(F,TO,T1,TLIM,XO,EMAX,EMIN,NE,DT,CONV,JUMP)
C
C          THIS ROUTINE INTEGRATES A SYSTEM OF FIRST-ORDER ORDINARY
C      DIFFERENTIAL EQUATIONS, USING THE ADAMS-MOULTON PREDICTOR-
C      CORRECTOR METHOD.  IN ORDER TO COMPUTE THE VALUE AT A PARTICULAR
C      TIME POINT, ADAMS-MOULTON REQUIRES THE VALUES OF THE DERIVATIVES
C      AT THE FOUR PRECEEDING TIME POINTS.  THE ALGORITHM USES A
C      FOURTH-ORDER RUNGE-KUTTA PROCESS TO GET THESE STARTING VALUES.
C          FOLLOWING EACH APPLICATION OF THE CORRECTOR, AN ESTIMATE
C      OF THE ERROR TERM IS MADE.  IF THE ERROR TERM IS TOO GREAT,
C      THE TIME STEP IS HALVED.  IF THE ERROR TERM IS SMALL ENOUGH
C      THAT THE DESIRED ACCURACY CAN BE ACHIEVED WITH LESS COMPUTATION,
C      THE TIME STEP IS DOUBLED.  IN EITHER CASE,THE CHANGE IN TIME
C      STEP MAKES SOME OF THE CURRENTLY SAVED VALUES FOR PREVIOUS TIME
C      POINTS INVALID, SO RUNGE-KUTTA IS USED AGAIN TO GENERATE THE
C      REQUIRED VALUES.
C          SINCE INTEG MAY CHANGE THE SIZE OF THE TIME STEP, IT MUST
C      BE AWARE OF THE END OF THE PRESENT TIME INTERVAL (T1). IT
C      ALSO USES 4 FLAGS -- JUMP, ICNTRL, K, AND IP -- TO KEEP TRACK
C      OF WHERE IT IS IN ITS COMPUTATIONS, AND WHAT VALUES IT HAS
C      AVAILABLE.
C
C      ARGUMENTS TO INTEG ARE;
C         F       VECTOR OF RATES OF CHANGE -- INPUT AND OUTPUT
C         TO      INITIAL TIME POINT
C         T1      FINAL TIME POINT
C         TLIM    MAXIMUM TIME STEP SIZE
C         XO      VECTOR OF VALUES -- INPUT AND OUTPUT
C         EMAX    IF AERR .GT. EMAX, DT IS HALVED
C         EMIN    IF AERR .LT. EMIN, DT IS DOUBLED
C         NE      NUMBER OF EQUATIONS
C         DT      INITIAL TIME STEP
C         CONV    IF DT .LT. CONV, AN ERROR MESSAGE IS PRINTED AND THE
C                 PROGRAM TERMINATES
C         JUMP    FLAG FOR PROGRAM PHASE; -1 -- START OF INTEGRATION
C                                          0 -- INTEGRATING
C                                         +1 -- END OF TIME INTERVAL
C
      COMMON/DICT/PNAME(3236),PELMNT(3236),SWT3,QX1,QX2
      DIMENSION XO(1),F(1),
     1   P(2000),C(2000),A(14000)
C    *CASE (JUMP -- PROGRAM PHASE)
      IJUMP=JUMP+2
      GO TO (40,60,80), IJUMP
C       *JUMP = -1 -- ORIGINAL RUNGE-KUTTA SETUP
   40 T1EPS=T1-1.0E-10
      T=TO
      DO 50 I=1,NE
      I1=7*(I-1)+1
      I3=I1+2
      C(I)=XO(I)
      A(I1)=XO(I)
      A(I3)=F(I)
   50 CONTINUE
      IP=1
      K=1
      JUMP=0
```

```
      GO TO 100
C          *JUMP = 0 -- ACTUAL INTEGRATION PHASE
C             *CASE (ICNTRL -- WHICH STAGE OF INTEGRATION IS NEXT)
   60 GO TO (115,125,135,142,212,232,90,221), ICNTRL
C          *JUMP = 1 -- FINISH THIS TIME INTERVAL, AND SET UP FOR NEXT.
C          *SETUP MAY REQUIRE RUNGE-KUTTA AGAIN IF TIME STEP HAS BEEN
C          * CHANGED (IF IP = 1).
   80 T1EPS=T1-1.0E-10
      JUMP=0
   84 GO TO (100,85,200,85), IP
   85 T=SAVET
      DT=SAVE
      DO 88 I=1,NE
      X0(I)=C(I)
   88 CONTINUE
      ICNTRL=7
      RETURN
C                 *ICNTRL = 7 -- A PART OF THE SETUP BETWEEN TIME STEPS
   90 DO 95 I=1,NE
      I1=7*(I-1)+1
      I3=I1+2
      I4=I1+3
      I5=I1+4
      I6=I1+5
      A(I6)=A(I5)
      A(I5)=A(I4)
      A(I4)=A(I3)
      A(I3)=F(I)
      A(I1)=X0(I)
   95 CONTINUE
      IP=IP-1
      IF(K.GE.4) IP=3
      GO TO 84
C     FOURTH ORDER RUNGE-KUTTA
  100 CONTINUE
      DT2=DT/2.
      DO 110 I=1,NE
      I1=7*(I-1)+1
      I2=I1+1
      I3=I2+1
      A(I2)=DT2*A(I3)
      X0(I)=A(I1)+A(I2)
  110 CONTINUE
      TDT2=T+DT2
      T0=TDT2
      ICNTRL=1
      RETURN
C                 *ICNTRL = 1 -- FIRST RUNGE-KUTTA VALUE.
  115 DO 120 I=1,NE
      I1=7*(I-1)+1
      I2=I1+1
      I7=I2+5
      A(I7)=DT2*F(I)
      A(I2)=A(I2)+2*A(I7)
      X0(I)=A(I1)+A(I7)
  120 CONTINUE
      ICNTRL=2
```

```
      RETURN
C                ICNTRL = 2 -- SECOND RUNGE-KUTTA VALUE
  125 DO 130 I=1,NF
      I1=7*(I-1)+1
      I2=I1+1
      I7=I2+5
      A(I7)=DT*F(I)
      A(I2)=A(I2)+A(I7)
      X0(I)=A(I1)+A(I7)
  130 CONTINUE
      TDT=T+DT
      T0=TDT
      ICNTRL=3
      RETURN
C                *ICNTRL = 3 -- THIRD R-K VALUE
  135 DO 140 I=1,NE
      I1=7*(I-1)+1
      I2=I1+1
      I7=I2+5
      A(I7)=DT2*F(I)
      X0(I)=A(I1)+(A(I2)+A(I7))/3.
  140 CONTINUE
      IF (IP .EQ. 2 .OR. IP .EQ. 4) GO TO 150
      K=K+1
      TEMP=T1+1.0E-10
      IF (TDT .GT. TEMP) GO TO 160
      T=TDT
      T0=T
      ICNTRL=4
      RETURN
C     UPDATE
C                *ICNTRL = 4 -- FOURTH R-K VALUE.
  142 DO 145 I=1,NE
      I1=7*(I-1)+1
      I3=I1+2
      I4=I3+1
      I5=I4+1
      I6=I5+1
      A(I6)=A(I5)
      A(I5)=A(I4)
      A(I4)=A(I3)
      A(I3)=F(I)
      A(I1)=X0(I)
  145 CONTINUE
C     *IF TIME INTERVAL FINISHED, MARK IT AND RETURN
      IF(T.LT.T1EPS) GO TO 146
      T0=T
      JUMP=1
      IF(K.GE.4) IP=3
      RETURN
C     *TIME INTERVAL NOT DONE: IF WE HAVE FOUR VALUES THEN USE A-M
C      TO PREDICT NEXT VALUE.  OTHERWISE, GO USE R-K AGAIN.
  146 IF(K.LT.4) GO TO 100
      GO TO 200
  150 T=TDT
      T0=T
      JUMP=1
```

```
      RETURN
  160 SAVE=DT
      SAVET=TDT
      DT=T1-T
      IP=2
      DO 170 I=1,NE
      C(I)=X0(I)
  170 CONTINUE
      GO TO 100
C     *ADAMS-MOULTON PREDICTOR
  200 CONTINUE
      IP=3
      DT24=DT/24.
      TDT=T+DT
      DO 210 I=1,NE
      I1=7*(I-1)+1
      I2=I1+1
      I3=I2+1
      I4=I3+1
      I5=I4+1
      I6=I5+1
      A(I2)=DT24*(55.*A(I3)-59.*A(I4)+37.*A(I5)-9.*A(I6))
      P(I)=A(I1)+A(I2)
      X0(I)=P(I)
  210 CONTINUE
      T0=TDT
      ICNTRL=5
      RETURN
C                *ICNTRL = 5 -- ADAMS-MOULTON CORRECTOR
  212 DO 215 I=1,NE
      I1=7*(I-1)+1
      I2=I1+1
      I3=I2+1
      I4=I3+1
      I5=I4+1
      I6=I5+1
      A(I2)=DT24*(9.*F(I)+19.*A(I3)-5.*A(I4)+A(I5))
      C(I)=A(I1)+A(I2)
      X0(I)=C(I)
  215 CONTINUE
C     *CHECK STEP SIZE -- MODIFY IT IF NECESSARY
      AERR=0.0
      DO 220 I=1,NE
      AE=ABS(C(I)-P(I))
      BE=AMAX1(1.0,ABS(C(I)))
      QX1=AE
      QX2=14.*BE
      ER=DIVIDE(QX1,QX2)
      IF(ER.LE.AERR) GO TO 220
      AERR=ER
      JK=I
  220 CONTINUE
      IF (AERR .LE. EMAX .AND. AERR .GE. EMIN) GO TO 230
      IF (AERR .GT. EMAX) GO TO 222
      IF (2.0*DT .GT. TLIM) GO TO 230
      DT=2.0*DT
      IP=1
```

```
      K=3
      TEMP=T1+1.0E-10
      IF(TDT.GT.TEMP) GO TO 238
      T=TDT
      T0=T
      ICNTRL=8
      RETURN
C                *ICNTRL = 8 -- DOUBLING TIME STEP: NEED TO USE R-K TO
C                 GET ANOTHER DRIVING VALUE FOR A-M METHOD
  221 DO 223 I=1,NE
      I1=7*(I-1)+1
      I3=I1+2
      I5=I1+4
      I6=I1+5
      A(I5)=A(I6)
      A(I3)=F(I)
      A(I1)=C(I)
  223 CONTINUE
      IF(T.LT.T1EPS) GO TO 100
      T0=T
      JUMP=1
      RETURN
C                *CUTTING TIME STEP IN HALF -- WILL NEED TO USE R-K TO
C                 GET MORE DRIVING VALUES FOR A-M
  222 IF(S*T3.EQ.1) WRITE(6,1939) T0,PNAME(JK),PELMNT(JK),AERR,DT,X0(JK)
     1,F(JK)
 1939 FORMAT(6X,*HALFING AT TIME=*,F8.3/9X,*CAUSED BY**,A6,A10,5X,
     1 *(ERROR=*,F10.5,*    H=*,F10.5,*   )*/12X,*V=*,F10.3,5X,*DV=*,
     2 F10.3)
      DT=0.5*DT
      IF (DT .LT. CONV) GO TO 225
      IP=1
      K=1
      GO TO 100
  225 WRITE(6,228)
  228 FORMAT(1X,*CONVERGENCE CONDITION VIOLATED*)
      JUMP=-1
      RETURN
  230 CONTINUE
      TEMP=T1+1.0E-10
      IF (TDT .GT. TEMP) GO TO 240
      T=TDT
      T0=T
      ICNTRL=6
      RETURN
C                *ICNTRL=6 -- MOVE SOLUTIONS UP, AND PREDICT NEXT SOL'N
C                 THIS SET OF INTEGRATIONS.
  232 DO 235 I=1,NE
      I1=7*(I-1)+1
      I3=I1+2
      I4=I3+1
      I5=I4+1
      I6=I5+1
      A(I6)=A(I5)
      A(I5)=A(I4)
      A(I4)=A(I3)
      A(I3)=F(I)
```

```
      A(I1)=C(I)
  235 CONTINUE
C     *IF STILL TIME LEFT IN INTERVAL, MAKE NEXT PREDICTION.
      IF(T.LT.T1EPS) GO TO 200
      T0=T
      JUMP=1
      RETURN
C               *DOUBLING TIME STEP, BUT ALREADY FINISHED WITH THIS TIME
C                INTERVAL -- COMPUTE R-K AT END OF TIME INTERVAL MINUS
C                THE NEW TIME STEP.
  238 DO 239 I=1,NE
      I1=7*(I-1)+1
      I3=I1+2
      I4=I1+3
      I6=I1+5
      A(I3)=A(I4)
      A(I4)=A(I6)
  239 CONTINUE
  240 SAVE=DT
      SAVET=TDT
      DT=T1-T
      IP=IP+1
      GO TO 100
      END
```

```
      SUBROUTINE LCHPTR(Z,NSUB,NCH,DATE,N,NMAX)
C
C     BUILDS VARIABLE FORMAT STATEMENTS CONTAINING LITERALS
C
      COMMON /TOCA/ CNTNTS(100,17),ENABLE
      COMMON /TOCB/ INDEX,INX2
      DIMENSION Z(1),NSUB(1)
      DIMENSION LABEL(7),HOLE(135)
      DIMENSION LABFORM(15)
      IF (N) 3000,1000,2000
 1000 CONTINUE
      N = N+1
      NPAGE = NPAGE+1
      WRITE (6,LABFORM)
      DO 1100 I=1,7
      LABEL(I) = 1H
 1100 CONTINUE
      NNCH = (NCH-1)/10+1
      NCH = 10*NNCH
      ENCODE (NCH,104,LABEL) (NSUB(I),I=1,NNCH)
      IF(ENABLE.GE.1) CNTNTS(INX2,9)=NPAGE
      WRITE(6,105) LABEL,DATE,NPAGE
 2000 IF(NMAX.LT.0) GO TO 2200
      WRITE (6,DATFORM) (Z(I),I=1,I2)
 2200 CONTINUE
      N = N+1
      IF (N.GT.IABS(NMAX)) N=0
      RETURN
 3000 CONTINUE
      I2=1
      DO 3050 I=1,132
      HOLE(I) = 1H
 3050 CONTINUE
      DECODE (NMAX,102,Z) (HOLE(I),I=1,NMAX)
      DO 3100 I=1,NMAX
      IF (HOLE(I).NE.1H ) GO TO 3200
 3100 CONTINUE
 3200 I1 = I
      J = 1
      DO 3300 I=I1,NMAX
      HOLE(J) = HOLE(I)
      J = J+1
      IF (HOLE(I).EQ.1H ) GO TO 3300
      I2 = J
 3300 CONTINUE
      HOLE(I2) =1H*
      I2=I2+1
      HOLE(I2) = 1H)
      J1 = (132-I2)/2-1
      IF (J1.LE.1) J1=1
      ENCODE(144,100,LABFORM)J1,HOLE
      I2 = -(N+1)/10+1
      ISP = (132+N)/2
      ENCODE (10,103,DATFORM) ISP
      RETURN
  100 FORMAT(5H(1H1,,I2,2HX*,135A1)
  102 FORMAT(132A1)
```

```
103 FORMAT(*(*I2*X13A10)*)
104 FORMAT(7A10)
105 FORMAT(1X,7A10,5X,A10,10X,4HPAGE,I5)
    END
```

```
         IDENT     EXP.
         ENTRY     EXP.
         EXT       SYS1ST.
*        VERSION OF EXPONENTIAL FUNCTION USED BY COMBAT II TO
*        ELIMINATE CONTROL DATA CORP. PROVIDED PARAMETER BOUNDS.
EXP0     EQ        *
         SA5       EXP0
         SA1       X1
         BX7       X5
         SA7       EXP.
         EQ        EXP.+1
EXP1     SA3       A2-1
         NX1       X1
         IX0       X2-X1
         IX7       X1-X3
         BX2       X0+X7
         MI        X2,EXP5
EXP2     FX3       X1*X5
         PX0       X6
         DX2       X1*X5
         SA5       A4+B1
         DX6       X3+X0
         RX1       X1*X4
         FX4       X3+X0
         NX3       X6
         BX0       -X0*X4
         RX6       X1+X2
         MX2       -4
         AX0       58
         BX1       -X2*X4
         RX7       X6+X3
         ZR        X3,EXP4
         SA3       A5+B1
         RX6       X7*X7
         SA2       A3+B1
         AX4       4
         SB2       X4-1777B+1720B
         RX5       X6*X5
         IX4       X1-X0
         SA1       TABLE+X4
         RX2       X2+X5
         SB3       B2+X0
         RX7       X7*X2
         FX3       X3+X6
         FX2       X3-X7
         FX3       X7/X2
         FX4       X1+X1
         FX7       X4*X3
         RX0       X1+X7
         PX6       X0,B3
EXP.     DATA      0
         UX2       B2,X1
         BX6       X6-X6
         SB3       1731B-1777B
         SB1       1
         SA5       CONST
         SA4       A5+B1
```

```
          LT        B2,B3,EXP2
          SA2       A5-B1
          EQ        B2,B3,EXP1
          ID,X1     EXP7
          LE        B2,B0,EXP1
EXP5      MI        X1,EXP8
EXP7      SB2       7500B+=C*TOO LARGE, FLOATING OVERFLOW*-EXP3
EXP3      RJ        SYS1ST.
          ID        X1,EXP.
          MX2       11
          AX1       60
          LX2       -1
          BX6       -X1*X2
          EQ        EXP.
EXP4      SA2       EXP6
          IX5       X1-X0
          AX4       4
          SA1       TABLE+X5
          FX3       X2*X7
          IX6       X4+X0
          SB3       1717B-1777B
          FX7       X3*X1
          PX1       B3
          RX2       X1+X7
          RX3       X1+X2
          UX4       B2,X3
          SB3       X6+B2
          PX6       X3,B3
          EQ        EXP.
EXP8      BX6       X6-X6
          EQ        EXP.
EXP6      DATA      .69314718055999S-4
          DATA      -675.818501045947
          DATA      741.667483199142
CONST     DATA      17400000561250731226B
          DATA      61176027741356764200B
P01       DATA      0.57761135831801 93E-1S-4
Q00       DATA      0.20813771196523 04E2S8
P00       DATA      0.72135034108448 19E1S4
TABLE     DATA      17204000000000000000B
          DATA      17204132530331746110B
          DATA      17204271270170765214B
          DATA      17204434172334725422B
          DATA      17204603376024306671B
          DATA      17204757246230110641B
          DATA      17205137732652330521B
          DATA      17205325407672441241B
          DATA      17205520236314774736B
          DATA      17205720424347654014B
          DATA      17206126345204252407B
          DATA      17206342221405217605B
          DATA      17206564237462553235B
          DATA      17207014633673025225B
          DATA      17207254030671756444B
          DATA      17207522257505222207B
          DATA      17207777777777777777B
          USE       /AFM/
```

```
                                                          AFF
SAVE        DATA        0
            END

STORAGE USED                116 STATEMENTS        17 SYMBOLS
MODEL 76 ASSEMBLY         0.066 SECONDS           38 REFERENCES
```

```
          IDENT     XDATE
          ENTRY     XDATE
*
*    RETURNS THE DATE
*
          VFD        42/5LXDATE,18/1
 XDATE    DATA       0
          SX6     A0
          SA6     SAVE
          SX3     X1
          SA1        JDMAC
          MX2        42
          BX6        X1*X2
          BX6        X6+X3
          SA6        JDMAC
 JDMAC    DATE       0
          SA1     SAVE
          SA0     X1
          JP         XDATE
 SAVE     DATA 0
          END
```

```
      PROGRAM AIROUT(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE3)
C
C            THIS PROGRAM TABULATES THE RESULTS OF A "COMBAT II"
C            RUN -- "AIR" VERSION.
C
      COMMON /XCOEF/ C0010X(2),C0020X(2),C0030X(2),C0040X(2),C0050X(2,2)
     1,C0211X(3,2),C0212X(3,2),C0213X(3,2),C0214X(3,2),C0215X(3,2,2),C02
     231X(2,2),C0232X(2,2),C0233X(2,2),C0234X(2,2),C0235X(2,2,2),C0242X(
     32),C0243X(2),C0244X(2),C0245X(2),C0251X(2),C0252X(2),C0253X(2),C02
     454X(2),C0255X(2,2),C0261X(2),C0262X(2),C0263X(2),C0264X(2),C0265X(
     52,2),C0307X(2,2,2),C0406X(2),C0407X(2),C0511X(2),C0512X(2,2),C0513
     6X(2,2),C0521X(2),C0522X(2)   ,C0551X(2),C0552X(2),C0601X,C0603X(3,2
     7),C0604X(2),C0605X(2),C0606X(2),C0607X(2),C0610X(2),C0611X(2),C061
     83X(2),C0614X(2),E0511X(2),E0512X(3,2,2),E052
     91X(2),F0001X(3,2),F0101X(3,2),F0102X(2),F0103X(2),F0104X(3,2),F010
     *5X(3,2),F0106X(3,2),F0107X(3,2,2),F0108X(3,2,2),F0109X(2),F0201X(3
     1,3,2),F0202X(3,3,2),F0301X(2,2),
     *F0302X(2,3,2),F0303X(2,3,2),F0304X(2,2),F0305X(2,2),F0306X(2,2,2),
     1F0307X(2,2),F0308X(2,2,2),F0401X(3,2),
     2F0402X(3,2),F0601X(3,2),P0001X(3,3,2),P0002X(3,3,2),P0003X(3,3,2),
     3P0004X(3,3,2),P0101X(3,2,2),P0102X(3,2,2),P0103X(3,2),P0104X(3,2),
     4P0105X(3,2), P0107X(3,2),P0108X(2,3,2),P0109X(2,3,2),P0301X(2,2),P
     50302X(2,2),P0303X(2,2),P0304X(2,2),P0305X(2,2,2),P0306X(2,2),P0307
     6X(2,2,2),P0323X(3,2,2),P0324X(3,2,2),P0325X(3,2,2),P0326X(3,2,4),
     7 P0327X(3,2,4),P0401X(2),P0402X(2),P0403X(2),P0404X(2),P0405X(2)
C
      COMMON /XCOEF1/ R0001X(2,3,2),R0301X(2,2),R0401X(2),R0402X(2),
     1R0571X(2,3,2),R0572X(2,2,2),R0574X(2),R0575X(2),R0576X(2),
     2R0577X(2),R0578X(2,2),R0579X(2,2),R0601X,R0602X(2),R0603X(2),
     3R0604X(2),R0605X(2),R0700X(2,2),V0541X(2,2),V0545X(2,2),
     4V0551X(2),V0552X(2),V0601X(3,2),V0(38,2)
C
      COMMON /PV/ V(38,2),AV(10,2),VA(702),C0001P(3,3,2),C0002P(3,3,2),
     1   C0003P(2,2),C0601P(3,2),D0601P(3,2),
     2D0602P(3,2),D0603P(3,2),D0604P(3,2),
     3   F0101P(3,3,2),F0103P(3,3,2),
     4F0105P(3,3,2),F0106P(3,2),F0107P(3,2),F0108P(3,2),F0109P(3,2,2),
     5F0110P(3,2,2),F0301P(2,3,2),F0302P(2,3,2),F0303P(2,2),
     6F0304P(2,2),F0305P(2,2,2),F0306P(2,2),F0307P(2,2,2),
     *F0321P(2,3,2),F0322P(2,3,2),F0323P(3,2,2),
     7P0101P(3,3,2),P0102P(3,3,2),P0103P(3,3,2),P0104P(3,3,2),
     8P0105P(3,2),P0106P(3,2),P0108P(3,2),P0110P(3,2,2),
     * P0301P(2,3,2),P0302P(2,3,2),P0303P(2,2),P0304P(2,2),P0305P(2,2,2)
     *              ,P0402P(3,2),P0403P(3,2),P0404P(3,2),P0405P(3,2),
     9V0301P(2,2),V0401P(3,2),V0402P(3,2),V0541P(2,2),V0542P(2,2),
     *V0545P(2,2),V0601P(3,2)
C
      COMMON /PDV/ DV(38,2),DAV(10,2),DVA(702)
      COMMON /VDATA/ A0001P(3,2),A0002P(3,2),A0101P(3,3,2),
     1A0102P(3,3,2),A0103P(3,2), A0104P(3,2),A0105P(3,2),
     2A0106P(2,3,2),A0107P(2,3,2),A0301P(2,3,2),A0302P(2,3,2),A0303P(2,2
     33),A0304P(2,2),A0305P(2,2,2),A0306P(2,2),A0307P(2,3,2),A0308P(2,3,2
     44),A0321P(3,3,2),A0322P(3,3,2),A0323P(3,2),A0324P(3,2),A0325P(3,2),
     5A0326P(3,2,2),A0327P(3,3,2),A0328P(3,3,2),A0401P(3,2),
     6A0402P(3,2),A0403P(3,2),A0404P(3,2),A0405P(3,2),A0501P(3,2),A0511P
     7(3,2),A0512P(3,2),A0513P(2,3,2),A0514P(3,2),A0515P(2,2),A0516P(2,2
     8),A0517P(2,3,2),A0521P(3,2),A0522P(3,2),A0531P(2),A0532P(2),A0533P
```

```
     9(2),A0540P(2),A0541P(2,2),A0542P(2,2),A0543P(2,2),A0544P(2,2),A055
     *1P(3,2),A0552P(3,2),A0561P(2),A0562P(2),A0563P(2),A0564P(2),E0511P
     1(2,2),E0512P(2,2),E0521P(3,2),E0551P(3,2),E0552P(3,2),R0001P(3,2,2
     2),R0002P(3,2),R0003P(3,2),R0004P(3,2),R0005P(2),R0006P(3,2,2),
     3  R0007P(3,2,2),R0301P(2,3,2),R0302P(2,3,2),R0303P(2,2),R0304P(2,2
     4),R0305P(2,2,2),R0306P(2,2),R0307P(2,2,2),R0321P(3,3,2),R0322P(3,3
     5    ,2),R0323P(3,2),R0324P(3,2),R0325P(3,2),R0326P(3,2,2),R0327P(3
     6,2,2),R0401P(3,2),R0402P(3,2),R0403P(3,2),R0404P(3,2),R0541P(2,2),
     7R0571P(2,3,2),R0572P(2,2,2),R0574P(2),R0575P(2),R0576P(2),R0577P(2
     8),R0578P(2,2),R0579P(2,2),R0601P(3,2),R0602P(3,2),R0603P(3,2),R060
     94P(3,2)
C
C           INITIALIZE "AIROUT" VARIABLES
C
      INTEGER S
      DIMENSION XCOEF(1),VDATA(1)
      EQUIVALENCE (VDATA(1),A0001P(1,1))
      DIMENSION DSCRPT(100,8),TIT5(3)
      DIMENSION X(120,10),TIME(10),SIDE(2),TITLE0(6)
      EQUIVALENCE (XCOEF(1),C0010X(1))
      DATA SIDE/10H BLUE DATA,10H  RED DATA/,ASTRK/1H*/,BLNK/1H /,
     1   NOVAR/2830/,NCV/702/
      DATA TIT5/10HRUN DESCRI,10HPTION:     ,10H          /
      DATA NG1F/0/,NG1R/4/,NL/4/,NG2F/6/,NG2R/10/,NM/10/,NS/13/,NB/13/,
     1   NSB/15/,NAJ/17/,NA4/23/,NA5/25/,NG5F/27/,NG5R/31/,NG6F/31/,
     2   NG6R/35/,NXF/35/,SWTB/1/
      REWIND 3
C
C           CHECK IF TAPE3 IS FROM "AIR" MODEL. GIVE ERROR MSG AND
C           STOP EXECUTION OF THE PROGRAM IF IT IS NOT.
C
      READ(3) AMODEL
      IF(AMODEL.NE.3HAIR) GOTO 9980
      I=0
 1000 I=I+1
C
C           READ FROM TAPE3 THE TITLE,DATE,DESCRIPTION AND TIME RANGE
C           OF THE "COMBAT II" RUN, CURRENTLY IN PROCESS.
C
      READ(3) (DSCRPT(I,K),K=1,8)
      IF(DSCRPT(I,1).NE.3HEND) GO TO 1000
      READ(3) TITLE0,DATE0,TINC,DELT,ERROR,DTINER,DTOUTER,TSTART,TEND,ALP
C
C           PRINT THE TITLE, DATE AND DESCRIPTION OF THE RUN.
C
      WRITE(6,2950) TITLE0,DATE0
      I=0
 1010 NTIMES=0
      WRITE(6,2952) (TIT5(K),K=1,3)
 1020 NTIMES=NTIMES+1
      I=I+1
      IF(DSCRPT(I,1).EQ.3HEND) GO TO 1030
      WRITE(6,2953) (DSCRPT(I,K),K=1,8)
      IF(NTIMES.GE.25) GO TO 1010
      GO TO 1020
 1030 IDSC = I + 2
C
```

```
C              READ A CONTROL CARD AND FROM TAPE3 READ THE DATA SET
C              SELECTED BY THAT CARD.   IF THE CONTROL CARD IS A "CHANGE"
C              CARD, SET THE SWITCH "SWTB" TO THE VALUE IN THE SECOND
C              FIELD OF THE CARD (TIME1).   MAKE SURE THAT THE STARTING
C              TIME ON THE CONTROL CARD IS WITHIN THE TIME RANGE OF THE
C              "COMBAT II" DATA ON TAPE3. GIVE AN ERROR MSG IF IT IS NOT
C              AND PROCEAD TO THE NEXT CONTROL CARD.
C
      READ(3) TT,(XCOEF(I),I=1,NOVAR)
 2000 READ(5,2990) A,TIME1,TYPE,N,S
      IF(EOF(5)) 9990,2005
 2005 IF(A.NE.6HCHANGE) GO TO 2006
      SWTB=TIME1
      GO TO 2000
 2006 IF((TIME1.LT.0).OR.(TIME1.GT.TEND)) GO TO 2800
      IF(TT.LE.TIME1) GO TO 2020
      REWIND 3
      DO 2009 I=1,IDSC
 2009 READ(3) DUMMY
 2010 READ(3) TT,(XCOEF(I),I=1,NOVAR)
 2020 IF(TT.LT.TIME1) GO TO 2010
C
C              OBTAIN THE VALUE OF "INTV" FROM THE FIRST FIELD OF THE
C              CONTROL CARD TO DETERMINE HOW MANY DATA SETS WILL BE
C              SKIPPED OVER BEFORE THE NEXT DATA SET IS READ.
C
      DECODE(7,2951,A) DUM,INTV
      IF(A.EQ.5HTYPE1) INTV=1
C
C              BRANCH TO THE PROGRAM SECTION INDICATED BY THE CONTROL
C              PARAMETERS "TYPE" AND "N".
C
      IF(TYPE.EQ.1HA) GO TO 2030
      IF(TYPE.EQ.1HM) GO TO 3000
      IF(TYPE.EQ.1HB) GO TO 4000
      IF(TYPE.EQ.1HR) GO TO 8000
      IF(TYPE.NE.1HG) GO TO 2022
      IF(N.EQ.1) GO TO 5000
      IF(N.EQ.2) GO TO 6000
      GO TO 7000
 2022 WRITE(6,2960) TYPE,N
      GO TO 2000
 9980 WRITE(6,2970) AMODEL
 9990 STOP
 2950 FORMAT(1H1//6X,*RUN NAME:*,6A10/6X,*   DATED:*,A10)
 2951 FORMAT(A4,I3)
 2952 FORMAT(1H1//16X,3A10//)
 2953 FORMAT(1X/21X,8A10)
 2960 FORMAT(//6X,*...UNKNOWN SYSTEM CODE...*,3X,1H=,A1,I1,1H=)
 2970 FORMAT(////* INCORRECT DATA ON TAPE3:  *,3X,A3)
 2990 FORMAT(A10,F5.0,A1,2I1)
C
C     ************
C     *          *
C     * A TABLES *
C     *          *
C     ************
```

```
C
C              INITITIALIZE LOCAL VARIABLES
C
 2030  SKIP=0.0
      DO 2035 I=1,10
      TIME(I)=0.0
      DO 2035 J=1,46
 2035 X(J,I)=0.0
C
C              DO FOR UP TO TEN DATA SETS
C
      DO 2050 I=1,10
C
C              PUT IN "VDATA" THE INTEGRATED VALUES (VA) OR THE RATES
C              OF CHANGE (DVA) OF THE VARIABLES THEREIN, DEPENDING ON
C              WHETHER "SWTB" IS POSITIVE OR NEGATIVE RESPECTIVELY.
C
      IF(SWTB.GT.0) GO TO 2032
      DO 2031 IKJ=1,NCV
 2031 VDATA(IKJ)=DVA(IKJ)
      GO TO 2034
 2032 DO 2033 IKJ=1,NCV
 2033 VDATA(IKJ)=VA(IKJ)
 2034 CONTINUE
C
C              COMPUTE THE DESIRED DISPLAY VARIABLES FROM THE
C              APPROPRIATE DATA.
C
      TIME(I)=TT
      X(1,I)=V(NAJ+2*N-1,S)+V(NAJ+2*N,S)
      X(2,I)=A0514P(N,S)
      X(3,I)=R0571P(N,S)
      X(4,I)=R0001P(N,S)
      X(3,I)=R0571P(1,N,S)+R0571P(2,N,S)
      X(4,I)=R0001P(N,1,S)+R0001P(N,2,S)
      X(5,I)=R0002P(N,S)
      X(6,I)=A0001P(N,S)
      X(7,I)=P0003P(N,S)
      X(8,I)=A0002P(N,S)
       SKIP= SKIP+X(7,I)
      X(9,I)=R0004P(N,S)
      DO 2036 J=1,3
      X(9+J*3,I)=R0321P(N,J,S)
      X(10+J*3,I)=R0322P(N,J,S)
 2036 X(8+J*3,I)=X(9+J*3,I)+X(10+J*3,I)
      X(10,I)=X(11,I)+X(14,I)+X(17,I)
      X(20,I)=X(9,I)-X(10,I)
      X(21,I)=R0323P(N,S)
      X(22,I)=R0324P(N,S)
      X(23,I)=R0326P(N,1,S)
      X(24,I)=R0326P(N,2,S)
      X(25,I)=R0325P(N,S)
      X(27,I)=R0327P(N,2,S)
      X(26,I)=R0327P(N,1,S)
      X(28,I)=A0512P(N,S)
      DO 2037 J=1,3
      X(27+J*2,I)=A0101P(J,N,S)
```

```
2037 X(28+J*2,I)=A0102P(J,N,S)
     X(35,I)=A0103P(N,S)
     X(36,I)=A0104P(N,S)
     X(37,I)=A0106P(1,N,S)
     X(38,I)=A0106P(2,N,S)
     X(39,I)=A0105P(N,S)
     X(40,I)=A0107P(1,N,S)
     X(41,I)=A0107P(2,N,S)
     X(42,I)=A0513P(1,N,S)+A0513P(2,N,S)
     X(43,I)=A0327P(1,N,S)+A0327P(2,N,S)+A0327P(3,N,S)
     X(44,I)=A0307P(1,N,S)+A0307P(2,N,S)
     X(45,I)=A0328P(1,N,S)+A0328P(2,N,S)+A0328P(3,N,S)
     X(46,I)=A0308P(1,N,S)+A0308P(2,N,S)
C
C             READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT
C             TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE"
C             PARAMETER.  (NOTE:  NEW VALUES IN "VA" AND "DVA")
C
     IF(TT.GE.TEND) GO TO 2060
     DO 2050 IKJ=1,INTV
     IF(TT.GE.TEND) GO TO 2060
2050 READ(3) TT,(XCOEF(J),J=1,NOVAR)
C
C             GENERATE THE RELEVANT PRINTOUT TABLES FOR UP TO TEN
C             TIME POINTS.
C
2060 WRITE(6,2910) TYPE,N,SIDE(S),(TIME(K1),K1=1,10),
    1    ((X(K2,I),I=1,10),K2=1,8)
     IF( SKIP.LE.1.E-50) GO TO 2070
     WRITE(6,2920) ((X(K3,I),I=1,10),K3=9,27)
     WRITE(6,2930) ((X(K4,I),I=1,10),K4=28,41)
2070 WRITE(6,2940) ((X(K5,I),I=1,10),K5=42,46)
     GO TO 2000
2800 WRITE(6,2900) TIME1,TSTART,TEND
     GO TO 2000
2900 FORMAT(8X,4HTIME,F10.2,27H IS OUT OF DATA TIME RANGE:,F7.2,
    +4H TO,F7.2)
2910 FORMAT(1H1//21X,7HSYSTEM:,A1,I1,5X,A10 ////5H TIME,26X,10(F8.1,2X)
    1    /1H ,13(10H**********)/
    2    7H TOTAL:,24X,10F10.3/
    3    13H NUMBER LOST:,18X,10F10.3/
    4    10H RESUPPLY:,21X,10(F7.0,3X)/1H ,13(10H**********)/
    5    16H TOTAL LAUNCHED:,15X,10F10.3//
    6    13H AA LAUNCHED:,18X,10F10.3/
    7    22H AA LOSSES DUE TO +AA:,9X,10F10.3//
    8    13H AG LAUNCHED:,18X,10F10.3/
    9    22H AG LOSSES DUE TO +AA:, 9X,10F10.3/1H ,13(10H**********))
2920 FORMAT(31H AG SURVIVING THE AIR BATTLE:  ,10F10.3//
    1    22H AG SENT TO THE FRONT:,9X,10F10.3/
    2    6X,6HTO F1:,19X,10F10.3/
    3    11X,13HAGAINST G1F1:,7X,10F10.3/
    4    11X,13HAGAINST G2F1:,7X,10F10.3/
    5    6X,6HTO F2:,19X,10F10.3/
    6    11X,13HAGAINST G1F2:,7X,10F10.3/
    7    11X,13HAGAINST G2F2:,7X,10F10.3/
    8    6X,6HTO F3:,19X,10F10.3/
    9    11X,13HAGAINST G1F3:,7X,10F10.3/
```

```
     *    11X,13HAGAINST G2F3:,7X,10F10.3//
     1    21H AG SENT TO THE REAR:,10X,10F10.3/
     2    11X,12HAGAINST G1R:,8X,10F10.3/
     3    11X,12HAGAINST G2R:,8X,10F10.3/
     4    11X,11HAGAINST L1:,9X,10F10.3/
     5    11X,11HAGAINST L2:,9X,10F10.3/
     6    11X,10HAGAINST S:,10X,10F10.3/
     7    11X,11HAGAINST B1:,9X,10F10.3/
     8    11X,11HAGAINST B2:,9X,10F10.3/1H ,13(10H**********))
 2930 FORMAT(25H AG LOST TO AIR DEFENSES:,6X,10F10.3//
     1    20H LOSSES DUE TO G1F1:,11X,10F10.3/
     2    15X,5HG2F1:,11X,10F10.3/
     3    15X,5HG1F2:,11X,10F10.3/
     4    15X,5HG2F2:,11X,10F10.3/
     5    15X,5HG1F3:,11X,10F10.3/
     6    15X,5HG2F3:,11X,10F10.3/
     7    16X,4HG1R:,11X,10F10.3/
     8    16X,4HG2R:,11X,10F10.3/
     9    17X,3HL1:,11X,10F10.3/
     *    17X,3HL2:,11X,10F10.3/
     1    18X,2HS:,11X,10F10.3/
     2    17X,3HB1:,11X,10F10.3/
     3    17X,3HB2:,11X,10F10.3/1H ,13(10H**********))
 2940 FORMAT(26H TOTAL LOST ON THE GROUND:,5X,10F10.3//
     1    25H LOSSES AT B1 DUE TO +AG:,6X,10F10.3/
     2    24H LOSSES AT B1 DUE TO +M:,7X,10F10.3/
     3    25H LOSSES AT B2 DUE TO +AG:,6X,10F10.3/
     4    24H LOSSES AT B2 DUE TO +M:,7X,10F10.3/1H ,13(10H**********))
C
C      ************
C      *          *
C      * M TABLES *
C      *          *
C      ************
C
 3000 DO 3060 I=1,2
C
C             PROCESS SYSTEM "M1" AND THEN "M2"
C
      IF(I.EQ.1) GO TO 3005
C
C             WHEN SYSTEM "M2" IS IN PROCESS READ FROM TAPE3 A SET OF
C             "COMBAT II" DATA CORRESPONDING TO THE "TIME1" CONTROL
C             PARAMETER AND TO THE TYPE OF OUTPUT TABLES SELECTED
C             IN THE LAST CONTROL CARD.
C
      REWIND 3
      DO 3006 IK=1,IDSC
 3006 READ(3) DUMMY
 3001 READ(3) TT,(XCOEF(J),J=1,NOVAR)
      IF(TT.LT.TIME1) GO TO 3001
 3005 CONTINUE
C
C             INITIALIZE LOCAL VARIABLES
C
      DO 3010 J=1,42
      DO 3010 K=1,10
```

```
      TIME(K)=0.0
 3010 X(J,K)=0.0
C
C               DO FOR UP TO TEN DATA SETS
C
      SKIP=0.0
      DO 3030 J=1,10
C
C               PUT IN "VDATA" THE INTEGRATED VALUES (VA) OR THE RATES
C               OF CHANGE (DVA) OF THE VARIABLES THEREIN, DEPENDING ON
C               WHETHER "SWTB" IS POSITIVE OR NEGATIVE RESPECTIVELY.
C
      IF(SWTB.GT.0) GO TO 3012
      DO 3011 IKJ=1,NCV
 3011 VDATA(IKJ)=DVA(IKJ)
      GO TO 3014
 3012 DO 3013 IKJ=1,NCV
 3013 VDATA(IKJ)=VA(IKJ)
 3014 CONTINUE
C
C               COMPUTE THE DESIRED DISPLAY VARIABLES FROM THE
C               APPROPRIATE DATA.
C
      TIME(J)=TT
      X(1,J)=V(NL+I,S)
      X(2,J)=R0541P(I,S)+A0542P(I,S)+A0543P(I,S)+A0544P(I,S)
      X(3,J)=R0578P(I,S)
      X(4,J)=V(NM+I,S)
      X(5,J)=A0541P(I,S)
      X(6,J)=R0578X(I,S)
      X(7,J)=V(NS,S)
      X(8,J)=A0540P(S)
      SKIP= SKIP+X(4,J)
      IF(X(7,J).GT.1.E-20) X(9,J)=V0542P(I,S)/X(7,J)
      X(10,J)=V0545P(I,S)
      X(11,J)=V0541P(I,S)
      X(12,J)=R0541P(I,S)
      X(13,J)=R0301P(I,1,S)
      X(14,J)=R0302P(I,1,S)
      X(15,J)=R0301P(I,2,S)
      X(16,J)=R0302P(I,2,S)
      X(17,J)=R0301P(I,3,S)
      X(18,J)=R0302P(I,3,S)
      X(19,J)=R0303P(I,S)
      X(20,J)=R0304P(I,S)
      X(21,J)=R0305P(I,1,S)
      X(22,J)=R0305P(I,2,S)
      X(23,J)=R0306P(I,S)
      X(24,J)=R0307P(I,1,S)
      X(25,J)=R0307P(I,2,S)
      X(26,J)=A0542P(I,S)+A0543P(I,S)+A0544P(I,S)
      X(33,J)=A0543P(I,S)
      X(34,J)=A0541P(I,S)
      X(35,J)=A0305P(1,I,S)
      X(36,J)=A0305P(2,I,S)
      X(37,J)=A0326P(1,I,S)
      X(38,J)=A0326P(2,I,S)
```

```
      X(39,J)=A0326P(3,I,S)
      X(40,J)=A0542P(I,S)
      X(41,J)=A0533P(S)
      X(42,J)=A0544P(I,S)
 3020 X(27,J)=A0540P(S)
      X(28,J)=A0306P(1,S)
      X(29,J)=A0306P(2,S)
      X(30,J)=A0325P(1,S)
      X(31,J)=A0325P(2,S)
      X(32,J)=A0325P(3,S)
C
C              READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT
C              TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE"
C              PARAMETER.  (NOTE:  NEW VALUES IN "VA" AND "DVA")
C
      IF(TT.GE.TEND) GO TO 3040
      DO 3030 IKJ=1,INTV
      IF(TT.GE.TEND) GO TO 3040
 3030 READ(3) TT,(XCOEF(K),K=1,NOVAR)
C
C              IF SOME LAUNCHERS ARE STILL FUNCTIONING OR THE SYSTEM IN
C              PROCESS IS "M1",  GENERATE BLOCKS OF PRINTOUT CONTAINING
C              THE VALUES OF SELECTED VARIABLES FOR UP TO TEN TIME POINTS.
C              IN ANY CASE, OMIT CERTAIN BLOCKS IF THERE ARE NO
C              FUNCTIONING LAUNCHERS.
C
 3040 IF(( SKIP.LE.1.E-50).AND.(I.EQ.2)) GO TO 2000
      WRITE(6,3910) I,SIDE(S),(TIME(K),K=1,10),((X(K1,K),K=1,10),K1=1,8)
      IF(SKIP.LE.1.E-50) GO TO 3050
      WRITE(6,3920)((X(K1,K),K=1,10),K1=9,11)
      WRITE(6,3930)((X(K1,K),K=1,10),K1=12,26)
 3050 WRITE(6,3940)((X(K1,K),K=1,10),K1=27,32)
      IF(SKIP.LE.1.E-50) GO TO 3060
      WRITE(6,3950)((X(K1,K),K=1,10),K1=33,42)
 3060 WRITE(6,3960)
      GO TO 2000
 3910 FORMAT(1H1//21X,8HSYSTEM:M,I1,5X,A10////5H TIME,26X,10(F8.1,2X)/
     1    1H ,13(10H**********)/
     2    7H TOTAL:,24X,10F10.3/
     3    21H NUMBER LOST OR USED:,10X,10F10.3/
     4    10H RESUPPLY:,21X,10(F7.0,3X)//
     5    9H TOTAL L:,22X,10F10.3/
     6    13H NUMBER LOST:,18X,10F10.3/
     7    10H RESUPPLY:,21X,10(F7.0,3X)//
     8    9H TOTAL S:,22X,10F10.3/
     9    13H NUMBER LOST:,18X,10F10.3/1H ,13(10H**********))
 3920 FORMAT(16H NUMBER M PER S:,15X,10F10.3/
     1    31H NUMBER IN TRANSIT IN REAR:     ,10F10.3/
     2    14H NUMBER PER L:,17X,10F10.3/1H ,13(10H**********))
 3930 FORMAT(18H TOTAL M LAUNCHED:,13X,10F10.3/
     1    31H NUMBER LAUNCHED AGAINST G1F1: ,10F10.3/
     2    25X,6HG2F1: ,10F10.3/
     3    25X,6HG1F2: ,10F10.3/
     4    25X,6HG2F2: ,10F10.3/
     5    25X,6HG1F3: ,10F10.3/
     6    25X,6HG2F3: ,10F10.3/
     7    26X,5HG1R: ,10F10.3/
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     8    26X,5HG2R: ,10F10.3/
     9    27X,4HL1: ,10F10.3/
     *    27X,4HL2: ,10F10.3/
     1    28X,3HS: ,10F10.3/
     2    27X,4HB1: ,10F10.3/
     3    27X,4HB2: ,10F10.3/1H ,13(10H**********)/
     4    16H TOTAL M LOSSES:,15X,10F10.3/)
 3940 FORMAT(16H TOTAL S LOSSES:,15X,10F10.3/
     1    11H DUE TO M1:,20X,10F10.3/
     2    8X,3HM2:,20X,10F10.3/
     3    8X,3HA1:,20X,10F10.3/
     4    8X,3HA2:,20X,10F10.3/
     5    8X,3HA3:,20X,10F10.3)
 3950 FORMAT(26H M LOSSES DUE TO S LOSSES:,5X,10F10.3//
     1    16H TOTAL L LOSSES:,15X,10F10.3/
     2    11H DUE TO M1:,20X,10F10.3/
     3    8X,3HM2:,20X,10F10.3/
     4    8X,3HA1:,20X,10F10.3/
     5    8X,3HA2:,20X,10F10.3/
     6    8X,3HA3:,20X,10F10.3/
     7    26H M LOSSES DUE TO L LOSSES:,5X,10F10.3//
     8    21H TOTAL G2R ATTRITION:,10X,10F10.3/
     9    31H M LOSSES DUE TO G2R LOSSES:    ,10F10.3)
 3960 FORMAT(1H ,13(10H**********))
C
C      ************
C      *          *
C      * B TABLES *
C      *          *
C      ************
C
C              INITIALIZE LOCAL VARIABLES
C
 4000 DO 4020 I=1,10
      DO 4020 J=1,34
 4020 X(J,I)=0.0
C
C              DO FOR UP TO TEN DATA SETS
C
      DO 4040 I=1,10
      TIME(I)=TT
C
C              PUT IN "VDATA" THE INTEGRATED VALUES (VA) OR THE RATES
C              OF CHANGE (DVA) OF THE VARIABLES THEREIN, DEPENDING ON
C              WHETHER "SWTB" IS POSITIVE OR NEGATIVE RESPECTIVELY.
C
      IF(SWTB.GT.0) GO TO 4022
      DO 4021 IKJ=1,NCV
 4021 VDATA(IKJ)=DVA(IKJ)
      GO TO 4024
 4022 DO 4023 IKJ=1,NCV
 4023 VDATA(IKJ)=VA(IKJ)
 4024 CONTINUE
C
C              COMPUTE THE DESIRED DISPLAY VARIABLES FROM THE
C              APPROPRIATE DATA.
C
```

```
      DO 4035 MM=1,2
      M=(MM-1)*34
      DO 4030 J=1,3
      K=J+M
      X(5+K,I)=V(NAJ+MM -2+2*J,S)
      X(9+K,I)=A0517P(MM,J,S)
      X(12+K,I)=R0571P(MM,J,S)
      X(20+K,I)=R0006P(J,MM,S)
      X(28+K,I)=R0007P(J,MM,S)
 4030 X(31+K,I)=F0323P(J,1,S)
      X(1+M,I)=V(NB+MM,S)
      X(2+M,I)=V(NSB+MM,S)
      X(3+M,I)=R0700X(MM,S)
      X(4+M,I)=C0003P(MM,S)
      X(5+M,I)=R0001P(1,MM,S)+R0001P(2,MM,S)+R0001P(3,MM,S)
      X(9+M,I)=X(10+M,I)+X(11+M,I)+X(12+M,I)
      X(16+M,I)=V(NA4+MM,S)
      X(17+M,I)=R0572P(MM,2,S)
      X(18+M,I)=E0511P(MM,S)
      X(19+M,I)=A0515P(MM,S)
      X(20+M,I)=X(21+M,I)+X(22+M,I)+X(23+M,I)
      X(24+M,I)=V(NA5+MM,S)
      X(25+M,I)=R0572P(MM,1,S)
      X(26+M,I)=E0512P(MM,S)
      X(27+M,I)=A0516P(MM,S)
 4035 X(28+M,I)=X(29+M,I)+X(30+M,I)+X(31+M,I)
C
C             READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT
C             TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE"
C             PARAMETER.  (NOTE:  NEW VALUES IN "VA" AND "DVA")
C
      IF(TT.GT.TEND) GO TO 4050
      DO 4040 IKJ=1,INTV
      IF(TT.GE.TEND) GO TO 4050
 4040 READ(3) TT,(XCOEF(J),J=1,NOVAR)
C
C             GENERATE THE RELEVANT PRINTOUT TABLES FOR UP TO TEN
C             TIME POINTS.
C
 4050 DO 4060 M=1,2
      K1=(M-1)*34+1
      K2=K1+14
      WRITE(6,4910) M,SIDE(S),(TIME(I),I=1,10),((X(J,I),I=1,10),J=K1,K2)
      K1=K2+1
      K2=K2+8
      WRITE(6,4920) ((X(J,I),I=1,10),J=K1,K2)
      K1=K2+1
      K2=K2+11
 4060 WRITE(6,4930) ((X(J,I),I=1,10),J=K1,K2)
      GO TO 2000
 4910 FORMAT(1H1//21X,8HSYSTEM:B,I1,5X,A10///5H TIME,26X,10(F8.1,2X)/
     1    1X,13(10H**********)/
     2    13H NUMBER OF B:,18X,10F10.3/
     3    19H UNREPAIRED DAMAGE:,12X,10F10.3/
     4    18H BASE REPAIR RATE:,13X,10F10.3/
     5    31H LAUNCH DEGRADATION FACTOR:     ,10F10.3/
     6    23H TOTAL AIRCRAFT LAUNCH:,8X,10F10.3//
```

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     7     19H NUMBER OF A1 ON B:,12X,10F10.3/
     8     8X,6HOF A2:,17X,10F10.3/
     9     8X,6HOF A3:,17X,10F10.3/
     *     17H TOTAL AB LOSSES:,14X,10F10.3/
     1     7X,11HA1B LOSSES:,13X,10F10.3/
     2     7X,11HA2B LOSSES:,13X,10F10.3/
     3     7X,11HA3B LOSSES:,13X,10F10.3/
     4     21H RESUPPLY RATE OF A1:,10X,10F10.3/
     5     21H RESUPPLY RATE OF A2:,10X,10F10.3/
     6     21H RESUPPLY RATE OF A3:,10X,10F10.3/1X,13(10H**********))
 4920 FORMAT(10H TOTAL A4:,21X,10F10.3/
     1     15H RESUPPLY RATE:,16X,10F10.3/
     2     19H TOTAL EXPENDITURE:,12X,10F10.3/
     3     31H TOTAL ASSOCIATED ATTRITION:    ,10F10.3/
     4     27H AIRCRAFT LAUNCHED WITH A4:,4X,10F10.3/
     5     4H A1:,27X,10F10.3/
     6     4H A2:,27X,10F10.3/
     7     4H A3:,27X,10F10.3/1X,13(10H**********))
 4930 FORMAT(10H TOTAL A5:,21X,10F10.3/
     1     15H RESUPPLY RATE:,16X,10F10.3/
     2     19H TOTAL EXPENDITURE:,12X,10F10.3/
     3     31H TOTAL ASSOCIATED ATTRITION:    ,10F10.3/
     4     27H AIRCRAFT LAUNCHED WITH A5:,4X,10F10.3/
     5     4H A1:,27X,10F10.3/
     6     4H A2:,27X,10F10.3/
     7     4H A3:,27X,10F10.3/
     8     25H,FRACTION OF A1G WITH A5:,6X,10F10.3/
     9     25H,FRACTION OF A2G WITH A5:,6X,10F10.3/
     *     25H,FRACTION OF A3G WITH A5:,6X,10F10.3/1X,13(10H**********))
C
C      *************
C      *           *
C      * G1 TABLES *
C      *           *
C      *************
C
C             INITIALIZE LOCAL VARIABLES
C
 5000 DO 5020 I=1,10
      DO 5010 J=1,92
 5010 X(J,I)=0.0
 5020 TIME(I)=0.0
C
C             DO FOR UP TO TEN DATA SETS
C
      DO 5050 I=1,10
C
C             PUT IN "VDATA" THE INTEGRATED VALUES (VA) OR THE RATES
C             OF CHANGE (DVA) OF THE VARIABLES THEREIN, DEPENDING ON
C             WHETHER "SWTB" IS POSITIVE OR NEGATIVE RESPECTIVELY.
C
      IF(SWTB.GT.0) GO TO 5022
      DO 5021 IKJ=1,NCV
 5021 VDATA(IKJ)=DVA(IKJ)
      GO TO 5024
 5022 DO 5023 IKJ=1,NCV
 5023 VDATA(IKJ)=VA(IKJ)
```

```
 5024 CONTINUE
C
C           COMPUTE THE DESIRED DISPLAY VARIABLES FROM THE
C           APPROPRIATE DATA.
C
      TIME(I)=TT
      X(2,I)=V(NG1F+1,S)
      X(3,I)=V(NG1F+2,S)
      X(4,I)=V(NG1F+3,S)
      X(5,I)=V(NG1R,S)
      X(1,I)=X(2,I)+X(3,I)+X(4,I)+X(5,I)
      X(7,I)=A0501P(1,S)
      X(8,I)=A0501P(2,S)
      X(9,I)=A0501P(3,S)
      X(10,I)=A0531P(S)
      X(6,I)=X(7,I)+X(8,I)+X(9,I)+X(10,I)
      X(11,I)=R0574P(S)
      X(13,I)=R0601P(1,S)
      X(14,I)=R0601P(2,S)
      X(15,I)=R0601P(3,S)
      X(12,I)=X(13,I)+X(14,I)+X(15,I)
      X(16,I)=V(NXF+1,S)
      X(17,I)=V(NXF+2,S)
      X(18,I)=V(NXF+3,S)
      X(19,I)=C0601X
      X(20,I)=R0601X
      X(21,I)=C0601P(1,S)
      X(22,I)=C0601P(2,S)
      X(23,I)=C0601P(3,S)
      X(24,I)=F0601X(1,S)
      X(25,I)=F0601X(2,S)
      X(26,I)=F0601X(3,S)
      X(27,I)=DV(NXF+1,S)
      X(28,I)=DV(NXF+2,S)
      X(29,I)=DV(NXF+3,S)
      DO 5030 J=1,3
      K=(J-1)*9
      X(30+K,I)=A0501P(J,S)
      X(31+K,I)=A0401P(J,S)
      X(32+K,I)=A0402P(J,S)
      X(33+K,I)=A0403P(J,S)
      X(34+K,I)=A0301P(1,J,S)
      X(35+K,I)=A0301P(2,J,S)
      X(36+K,I)=A0321P(1,J,S)
      X(37+K,I)=A0321P(2,J,S)
 5030 X(38+K,I)=A0321P(3,J,S)
      X(57,I)=A0531P(S)
      X(58,I)=A0303P(1,S)
      X(59,I)=A0303P(2,S)
      X(60,I)=A0323P(1,S)
      X(61,I)=A0323P(2,S)
      X(62,I)=A0323P(3,S)
      DO 5040 J=1,3
      X(62+J,I)=D0601P(J,S)
      X(65+J,I)=V0601X(J,S)
 5040 X(69+J,I)=R0601P(J,S)
      X(69,I)=R0602X(S)
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```
      K=3-S
      SS=3-S
      DO 5041 J=1,10
      X(72+J,I)=V(J,SS)
 5041 X(82+J,I)=AV(J,S)
C
C              READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT
C              TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE"
C              PARAMETER.  (NOTE:  NEW VALUES IN "VA" AND "DVA")
C
      IF(TT.GE.TEND) GO TO 5060
      DO 5050 IKJ=1,INTV
      IF(TT.GE.TEND) GO TO 5060
 5050 READ(3) TT,(XCOEF(J),J=1,NOVAR)
C
C              GENERATE THE RELEVANT PRINTOUT TABLES FOR UP TO TEN
C              TIME POINTS.
C
 5060 WRITE(6,5910) SIDE(S),(TIME(K),K=1,10),((X(J,I),I=1,10),J=1,15)
      WRITE(6,5920) ((X(J,I),I=1,10),J=16,29)
      DO 5070 K=1,3
      K1=(K-1)*9+30
      K2=K1+8
 5070 WRITE(6,5930)K,((X(J,I),I=1,10),J=K1,K2)
      WRITE(6,5940) ((X(J,I),I=1,10),J=57,62)
      WRITE(6,5950) ((X(J,I),I=1,10),J=63,72)
      WRITE(6,5960) ((X(J,I),I=1,10),J=73,82)
      WRITE(6,5961) ((X(J,I),I=1,10),J=83,92)
      GO TO 2000
 5910 FORMAT(1H1//21X,9HSYSTEM:G1,5X,A10////5H TIME,26X,10(F8.1,2X)/
     1     1H ,13(10H**********)/
     2     7H TOTAL:,24X,10F10.3/
     3     9H   AT F1:,22X,10F10.3/
     4     9H   AT F2:,22X,10F10.3/
     5     9H   AT F3:,22X,10F10.3/
     6     8H   IN R:,23X,10F10.3//
     7     14H TOTAL LOSSES:,17X,10F10.3/
     8      9H   AT F1:,22X,10F10.3/
     9      9H   AT F2:,22X,10F10.3/
     *      9H   AT F3:,22X,10F10.3/
     1      8H   IN R:,23X,10F10.3//
     2     10H RESUPPLY:,21X,10(F7.0,3X)//
     3     17H MOVEMENT R TO F:,14X,10F10.3/
     4     9H   TO F1:,22X,10F10.3/
     5     9H   TO F2:,22X,10F10.3/
     6     9H   TO F3:,22X,10F10.3/1H ,13(10H**********))
 5920 FORMAT(20H FEBA POSITION (F1):,11X,10F10.3/
     1     15X,5H(F2):,11X,10F10.3/
     2     15X,5H(F3):,11X,10F10.3//
     3     31H SHAPING FACTOR FOR FEBA MOVE: ,10F10.3//
     4     24H MAX FEBA MOVEMENT RATE:,7X,10F10.3//
     5     31H R FACTOR FOR FEBA MOVE (F1):  ,10F10.3/
     6     24X,7H(F2):  ,10F10.3/
     7     24X,7H(F3):  ,10F10.3//
     8     30H FRACTION OF MAX FEBA MOVEMENT/
     9     20H     COMMANDED BY F1:,11X,10F10.3/
     *     17X,3HF2:,11X,10F10.3/
```

```
     1    17X,3HF3:,11X,10F10.3//
     2    18H FEBA RATE  AT F1:,13X,10F10.3/
     3    15X,3HF2:,13X,10F10.3/
     4    15X,3HF3:,13X,10F10.3/1H ,13(10H**********))
 5930 FORMAT(12H LOSSES AT F,I1,1H:,17X,10F10.3/
     1    14H     DUE TO G1:,17X,10F10.3/
     2    11X,3HG5:,17X,10F10.3/
     3    11X,3HG6:,17X,10F10.3/
     4    11X,3HM1:,17X,10F10.3/
     5    11X,3HM2:,17X,10F10.3/
     6    11X,3HA1:,17X,10F10.3/
     7    11X,3HA2:,17X,10F10.3/
     8    11X,3HA3:,17X,10F10.3/)
 5940 FORMAT(13H LOSSES IN R:,18X,10F10.3/
     1    14H     DUE TO M1:,17X,10F10.3/
     2    11X,3HM2:,17X,10F10.3/
     3    11X,3HA1:,17X,10F10.3/
     4    11X,3HA2:,17X,10F10.3/
     5    11X,3HA3:,17X,10F10.3/1H ,13(10H**********))
 5950 FORMAT(21H DEMAND FOR G1 IN F1:,10X,10F10.3/
     1    18X,3HF2:,10X,10F10.3/
     2    18X,3HF3:,10X,10F10.3//
     3    25H MAXIMUM USABLE G1 AT F1:,6X,10F10.3/
     4    22X,3HF2:,6X,10F10.3/
     5    22X,3HF3:,6X,10F10.3//
     6    31H MAXIMUM MOVEMENT OF G1 R TO F:,10F10.3//
     7    24H MOVEMENT OF G1 R TO F1:,7X,10F10.3/
     8    21X,3HF2:,7X,10F10.3/
     9    21X,3HF3:,7X,10F10.3/1H ,13(10H**********))
 5960 FORMAT(1X///1X,13(10H**********)/
     1    46X,22HCENTRAL COMMAND SYSTEM/1X,13(10H**********)/
     2    24H NUMBER OF TARGETS,TYPE=/
     3    19X,5HG1F1:,7X,10F10.3/
     4    19X,5HG1F2:,7X,10F10.3/
     5    19X,5HG1F3:,7X,10F10.3/
     9    20X,4HG1R:,7X,10F10.3/
     1    21X,3HL1:,7X,10F10.3/
     2    21X,3HL2:,7X,10F10.3/
     3    19X,5HG2F1:,7X,10F10.3/
     4    19X,5HG2F2:,7X,10F10.3/
     5    19X,5HG2F3:,7X,10F10.3/
     6    20X,4HG2R:,7X,10F10.3//)
 5961 FORMAT(28H NUMBER OF ACQUIRED TARGETS=/
     1    23X,8HG1F1:    ,10F10.3/
     2    23X,8HG1F2:    ,10F10.3/
     3    23X,8HG1F3:    ,10F10.3/
     7    24X,7HG1R:    ,10F10.3/
     9    25X,6HL1:    ,10F10.3/
     *    25X,6HL2:    ,10F10.3/
     1    23X,8HG2F1:    ,10F10.3/
     2    23X,8HG2F2:    ,10F10.3/
     3    23X,8HG2F3:    ,10F10.3/
     4    24X,7HG2R:    ,10F10.3/1X,13(10H**********))
C
C      *************
C      *           *
C      * G2 TABLES *
```

```
C      *            *
C      **************
C
C             INITIALIZE LOCAL VARIABLES
C
 6000 DO 6020 I=1,10
      DO 6010 J=1,64
 6010 X(J,I)=0.0
 6020 TIME(I)=0.0
      SWTC=0
      IF(S.GT.2) SWTC=1
      IF(S.GT.2) S=S-2
C
C             DO FOR UP TO TEN DATA SETS
C
      DO 6060 I=1,10
C
C             PUT IN "VDATA" THE INTEGRATED VALUES (VA) OR THE RATES
C             OF CHANGE (DVA) OF THE VARIABLES THEREIN, DEPENDING ON
C             WHETHER "SWTB" IS POSITIVE OR NEGATIVE RESPECTIVELY.
C
      IF(SWTB.GT.0) GO TO 6022
      DO 6021 IKJ=1,NCV
 6021 VDATA(IKJ)=DVA(IKJ)
      GO TO 6024
 6022 DO 6023 IKJ=1,NCV
 6023 VDATA(IKJ)=VA(IKJ)
 6024 CONTINUE
C
C             COMPUTE THE DESIRED DISPLAY VARIABLES FROM THE
C             APPROPRIATE DATA.
C
      TIME(I)=TT
      Q=24.0*E0521X(S)
      DO 6030 J=1,3
      X(1+J,I)=V(NG2F+J,S)
      IF(SWTC.NE.1) X(1+J,I)=DIVIDE(X(1+J,I),V(NG1F+J,S)*Q)
      X(6+J,I)=A0521P(J,S)+A0522P(J,S)+E0521P(J,S)
 6030 X(13+J,I)=R0602P(J,S)
      X(5,I)=V(NG2R,S)
      IF(SWTC.NE.1) X(5,I)=DIVIDE(X(5,I),Q*V(NG1R,S))
      X(10,I)=A0532P(S)+A0533P(S)
      X(1,I)=X(2,I)+X(3,I)+X(4,I)+X(5,I)
      IF(SWTC.NE.1) X(1,I)=DIVIDE(V(NG2F+1,S)+V(NG2F+2,S)+V(NG2F+3,S)+
     1   V(NG2R,S),Q*(V(NG1F+1,S)+V(NG1F+2,S)+V(NG1F+3,S)+V(NG1R,S)))
      X(6,I)=X(7,I)+X(8,I)+X(9,I)+X(10,I)
      X(11,I)=C0607X(S)
      X(12,I)=R0575P(S)
      X(13,I)=X(14,I)+X(15,I)+X(16,I)
      X(17,I)=A0521P(1,S)+A0521P(2,S)+A0521P(3,S)+A0532P(S)
      DO 6040 J=1,3
      K=(J-1)*8
      X(18+K,I)=A0521P(J,S)
      X(19+K,I)=A0404P(J,S)
      X(20+K,I)=A0405P(J,S)
      X(21+K,I)=A0302P(1,J,S)
      X(22+K,I)=A0302P(2,J,S)
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```
      X(23+K,I)=A0322P(1,J,S)
      X(24+K,I)=A0322P(2,J,S)
 6040 X(25+K,I)=A0322P(3,J,S)
      X(42,I)=A0532P(S)
      X(43,I)=A0304P(1,S)
      X(44,I)=A0304P(2,S)
      X(45,I)=A0324P(1,S)
      X(46,I)=A0324P(2,S)
      X(47,I)=A0324P(3,S)
      X(49,I)=E0521P(1,S)+A0522P(1,S)
      X(50,I)=E0521P(2,S)+A0522P(2,S)
      X(51,I)=E0521P(3,S)+A0522P(3,S)
      X(52,I)=A0533P(S)
      X(48,I)=X(49,I)+X(50,I)+X(51,I)+X(52,I)
      X(53,I)=C0606X(S)
      X(54,I)=F0521X(S)
      DO 6050 J=1,3
      X(61+J,I)=V0601P(J,S)
      X(54+J,I)=D0602P(J,S)
 6050 X(58+J,I)=R0602P(J,S)
      X(58,I)=R0603X(S)
C
C             READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT
C             TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE"
C             PARAMETER. (NOTE: NEW VALUES IN "VA" AND "DVA")
C
      IF(TT.GE.TEND) GO TO 6070
      DO 6060 IKJ=1,INTV
      IF(TT.GE.TEND) GO TO 6070
 6060 READ(3) TT,(XCOEF(J),J=1,NOVAR)
C
C             GENERATE THE RELEVANT PRINTOUT TABLES FOR UP TO TEN
C             TIME POINTS.
C
 6070 WRITE(6,6910) SIDE(S),(TIME(K),K=1,10),((X(J,I),I=1,10),J=1,16)
      WRITE(6,6920) (X(17,I),I=1,10)
      DO 6080 J=1,3
      K1=(J-1)*8+18
      K2=K1+7
 6080 WRITE(6,6930) J,((X(K,I),I=1,10),K=K1,K2)
      WRITE(6,6940) ((X(J,I),I=1,10),J=42,54)
      WRITE(6,6950) ((X(J,I),I=1,10),J=55,64)
      GO TO 2000
 6910 FORMAT(1H1//21X,9HSYSTEM:G2,5X,A10////5H TIME,26X,10(F8.1,2X)/
     1    1H ,13(10H**********)/
     2    7H TOTAL:,24X,10F10.3/
     3    8H  AT F1:,23X,10F10.3/
     4    8H  AT F2:,23X,10F10.3/
     5    8H  AT F3:,23X,10F10.3/
     6    7H  IN R:,24X,10F10.3//
     7    20H TOTAL LOST OR USED:,11X,10F10.3/
     8    8H  AT F1:,23X,10F10.3/
     9    8H  AT F2:,23X,10F10.3/
     *    8H  AT F3:,23X,10F10.3/
     1    7H  IN R:,24X,10F10.3//
     2    31H PORTION OF G2 TO BE REPLACED: ,10F10.3//
     3    10H RESUPPLY:,21X,10(F7.0,3X)//
```

```
     4    20H MOVEMENT G2 R TO F:,11X,10F10.3/
     5    15X,6HTO F1:,10X,10F10.3/
     6    15X,6HTO F2:,10X,10F10.3/
     7    15X,6HTO F3:,10X,10F10.3/1H ,13(10H**********))
 6920 FORMAT(14H TOTAL LOSSES:,17X,10F10.3)
 6930 FORMAT( 7H   AT F,I1,1H:,22X,10F10.3/
     1    15H      DUE TO G5:,16X,10F10.3/
     2    12X,3HG6:,16X,10F10.3/
     3    12X,3HM1:,16X,10F10.3/
     4    12X,3HM2:,16X,10F10.3/
     5    12X,3HA1:,16X,10F10.3/
     6    12X,3HA2:,16X,10F10.3/
     7    12X,3HA3:,16X,10F10.3/)
 6940 FORMAT(8H   IN R:,23X,10F10.3/
     1    15H      DUE TO M1:,16X,10F10.3/
     2    12X,3HM2:,16X,10F10.3/
     3    12X,3HA1:,16X,10F10.3/
     4    12X,3HA2:,16X,10F10.3/
     5    12X,3HA3:,16X,10F10.3//
     6    31H TOTAL USED BY OR LOST WITH G1:,10F10.3/
     7    9H   AT F1:,22X,10F10.3/
     8    9H   AT F2:,22X,10F10.3/
     9    9H   AT F3:,22X,10F10.3/
     *    8H   IN R:,23X,10F10.3//
     1    21H NUMBER OF G2 PER G1:,10X,10F10.3/
     2    26H NUMBER OF G2 USED PER G1:,5X,10F10.3/1H ,13(10H**********))
 6950 FORMAT(14H DEMAND AT F1:,17X,10F10.3/
     1    11X,3HF2:,17X,10F10.3/
     2    11X,3HF3:,17X,10F10.3//
     3    27H MAX MOVEMENT OF G2 R TO F:,4X,10F10.3//
     4    21H MOVEMENT G2 R TO F1:,10X,10F10.3/
     5    18X,3HF2:,10X,10F10.3/
     6    18X,3HF3:,10X,10F10.3//
     7    26H MAXIMUM G2 DESIRED AT F1:,5X,10F10.3/
     8    23X,3HF2:,5X,10F10.3/
     9    23X,3HF3:,5X,10F10.3/1X,13(10H**********))
C
C        ***************************
C        *                         *
C        * G3/G5 AND G4/G6 TABLES  *
C        *                         *
C        ***************************
C
C              INITIALIZE LOCAL VARIABLES
C
 7000 DO 7020 I=1,10
      DO 7010 J=1,111
 7010 X(J,I)=0.0
 7020 TIME(I)=0.0
      SKIP=SKIP2=0.0
      X(111,1)=C0406X(S)
      X(111,2)=C0407X(S)
C
C              DO FOR UP TO TEN DATA SETS
C
      DO 7150 I=1,10
C
```

```
C             PUT IN "VDATA" THE INTEGRATED VALUES (VA) OR THE RATES
C             OF CHANGE (DVA) OF THE VARIABLES THEREIN, DEPENDING ON
C             WHETHER "SWTB" IS POSITIVE OR NEGATIVE RESPECTIVELY.
C
      IF(SWTB.GT.0) GO TO 7022
      DO 7021 IKJ=1,NCV
 7021 VDATA(IKJ)=DVA(IKJ)
      GO TO 7024
 7022 DO 7023 IKJ=1,NCV
 7023 VDATA(IKJ)=VA(IKJ)
 7024 CONTINUE
      TIME(I)=TT
C
C             IF ANY NUCLEAR ARTILLERY TUBES EXIST, COMPUTE THE
C             DESIRED DISPLAY VARIABLES ASSOCIATED WITH NUCLEAR ARTY.
C
      IF(C0406X(S).LE.0.0) GO TO 7110
      DO 7030 J=1,3
      X(1+J,I)=V0401P(J,S)
      X(6+J,I)=C0406X(S)*A0501P(J,S)
 7030 X(12+J,I)=C0406X(S)*R0601P(J,S)
      X(5,I)=C0406X(S)*V(NG1R,S)
      X(10,I)=C0406X(S)*A0531P(S)
      X(11,I)=C0406X(S)*R0574P(S)
      X(1,I)=X(2,I)+X(3,I)+X(4,I)+X(5,I)
      X(6,I)=X(7,I)+X(8,I)+X(9,I)+X(10,I)
      X(12,I)=X(13,I)+X(14,I)+X(15,I)
      SKIP=AMAX1(SKIP,V(NG5F+1,S),V(NG5F+2,S),V(NG5F+3,S),V(NG5R,S))
      DO 7040 J=1,3
      X(16+J,I)=V(NG5F+J,S)
      X(21+J,I)=E0551P(J,S)+A0551P(J,S)
      X(28+J,I)=R0603P(J,S)
      K=(J-1)*3+1
      X(33+K,I)=E0551P(J,S)
      X(34+K,I)=R0401P(J,S)
      X(35+K,I)=R0403P(J,S)
      X(43+J,I)=A0551P(J,S)
      X(48+J,I)=D0603P(J,S)
 7040 X(52+J,I)=R0603P(J,S)
      X(20,I)=V(NG5R,S)
      X(16,I)=X(17,I)+X(18,I)+X(19,I)+X(20,I)
      X(25,I)=A0561P(S)+A0563P(S)
      X(21,I)=X(22,I)+X(23,I)+X(24,I)+X(25,I)
      X(26,I)=C0611X(S)
      X(27,I)=R0576P(S)
      X(28,I)=X(29,I)+X(30,I)+X(31,I)
      X(32,I)=V0551X(S)
      X(33,I)=X(34,I)+X(37,I)+X(40,I)
      X(47,I)=A0561P(S)
      X(48,I)=A0563P(S)
      X(43,I)=X(44,I)+X(45,I)+X(46,I)+X(47,I)+X(48,I)
      X(52,I)=R0604X(S)
C
C             IF ANY FRONTAL SSM LAUNCHERS EXIST, COMPUTE THE
C             DESIRED DISPLAY VARIABLES ASSOCIATED WITH THE SSM"S.
C
 7110 IF(C0407X(S).LE.0.0) GO TO 7140
```

```
      DO 7120 J=1,3
      X(56+J,I)=V0402P(J,S)
      X(61+J,I)=C0407X(S)*A0501P(J,S)
 7120 X(67+J,I)=C0407X(S)*R0601P(J,S)
      X(60,I)=C0407X(S)*V(NG1R,S)
      X(65,I)=C0407X(S)*A0531P(S)
      X(66,I)=C0407X(S)*R0574P(S)
      X(56,I)=X(57,I)+X(58,I)+X(59,I)+X(60,I)
      X(61,I)=X(62,I)+X(63,I)+X(64,I)+X(65,I)
      X(67,I)=X(68,I)+X(69,I)+X(70,I)
      SKIP2=AMAX1(SKIP2,V(NG6F+1,S),V(NG6F+2,S),V(NG6F+3,S),V(NG6R,S))
      DO 7130 J=1,3
      X(71+J,I)=V(NG6F+J,S)
      X(76+J,I)=F0552P(J,S)+A0552P(J,S)
      X(83+J,I)=R0604P(J,S)
      K=J*3-2
      X(88+K,I)=F0552P(J,S)
      X(89+K,I)=R0402P(J,S)
      X(90+K,I)=R0404P(J,S)
      X(98+J,I)=A0552P(J,S)
      X(103+J,I)=D0604P(J,S)
 7130 X(107+J,I)=R0604P(J,S)
      X(75,I)=V(NG6R,S)
      X(71,I)=X(72,I)+X(73,I)+X(74,I)+X(75,I)
      X(80,I)=A0562P(S)+A0564P(S)
      X(76,I)=X(77,I)+X(78,I)+X(79,I)+X(80,I)
      X(81,I)=C0614X(S)
      X(82,I)=R0577P(S)
      X(83,I)=X(84,I)+X(85,I)+X(86,I)
      X(87,I)=V0552X(S)
      X(88,I)=X(89,I)+X(92,I)+X(95,I)
      X(102,I)=A0562P(S)
      X(103,I)=A0564P(S)
      X(98,I)=X(99,I)+X(100,I)+X(101,I)+X(102,I)+X(103,I)
      X(107,I)=R0605X(S)
C
C             READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT
C             TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE"
C             PARAMETER.  (NOTE:  NEW VALUES IN "VA" AND "DVA")
C
 7140 IF(TT.GE.TEND) GO TO 7155
      DO 7150 IKJ=1,INTV
      IF(TT.GE.TEND) GO TO 7155
 7150 READ(3) TT,(XCOEF(J),J=1,NOVAR)
C
C             IF FRONTAL SSM LAUNCHERS OR NUCLEAR ARTY TUBES EXIST,
C             PRINT THE VALUES OF SELECTED QUANTITIES  RELATED TO THE
C             EXISTING WEAPONS SYSTEM (SSM AND/OR NUC), FOR UP TO TEN
C             TIME POINTS.
C
 7155 X(111,3)=SKIP
      X(111,4)=SKIP2
      DO 7180 I=1,2
      K1=2+I
      K2=4+I
      IF(X(111,I).LE.0.0) GO TO 7160
      K1=2+I
```

```
      K3=(I-1)*55+1
      K4=K3+14
      WRITE(6,7910) K1,K2,SIDE(S),(TIME(J),J=1,10),K1,((X(J,K),K=1,10),
     1   J=K3,K4)
      IF(X(111,2+T).LE.0.0) GO TO 7170
      K3=K4+1
      K4=K3+16
      WRITE(6,7920) K2,((X(J,K),K=1,10),J=K3,K4)
      K3=K4+1
      K4=K3+15
      WRITE(6,7930) ((X(J,K),K=1,10),J=K3,K4)
      K3=K4+1
      K4=55*I
      WRITE(6,7940) ((X(J,K),K=1,10),J=K3,K4)
      GO TO 7180
C
C              PRINT A MSG INDICATING LACK OF DATA FOR ONE OR MORE
C              WEAPONS SYSTEMS.
C
 7160 WRITE(6,7950) SIDE(S),K1
 7170 WRITE(6,7950) SIDE(S),K2
 7180 CONTINUE
      GO TO 2000
 7910 FORMAT(1H1//21X,8HSYSTEM:G,I1,6H AND G,I1,5X,A10////5H TIME,26X,
     1   10(F8.1,2X)/1H ,13(10H**********)/
     2   8H TOTAL G,I1,1H:,21X,10F10.3/
     3   9H   AT F1:,22X,10F10.3/
     4   9H   AT F2:,22X,10F10.3/
     5   9H   AT F3:,22X,10F10.3/
     6   8H   IN R:,23X,10F10.3//
     7   14H TOTAL LOSSES:,17X,10F10.3/
     8   9H   AT F1:,22X,10F10.3/
     9   9H   AT F2:,22X,10F10.3/
     *   9H   AT F3:,22X,10F10.3/
     1   8H   IN R:,23X,10F10.3//
     2   10H RESUPPLY:,21X,10(F7.0,3X)//
     3   22H MOVEMENT FROM R TO F:,9X,10F10.3/
     4   17X,6HTO F1:,8X,10F10.3/
     5   17X,6HTO F2:,8X,10F10.3/
     6   17X,6HTO F3:,8X,10F10.3/1H ,13(10H**********))
 7920 FORMAT(1H ,13(10H**********)/8H TOTAL G,I1,1H:,21X,10F10.3/
     1   9H   AT F1:,22X,10F10.3/
     2   9H   AT F2:,22X,10F10.3/
     3   9H   AT F3:,22X,10F10.3/
     4   8H   IN R:,23X,10F10.3//
     5   19H TOTAL LOST / USED:,12X,10F10.3/
     6   9H   AT F1:,22X,10F10.3/
     7   9H   AT F2:,22X,10F10.3/
     8   9H   AT F3:,22X,10F10.3/
     9   8H   IN R:,23X,10F10.3//
     *   24H PORTION TO BE REPLACED:,7X,10F10.3//
     1   10H RESUPPLY:,21X,10(F7.0,3X)//
     2   23H TOTAL MOVEMENT R TO F:,8X,10F10.3/
     3   18X6HTO F1:,7X,10F10.3/
     4   18X,6HTO F2:,7X,10F10.3/
     5   18X,6HTO F3:,7X,10F10.3//
     6   31H MAX NUMBER IN TRANSIT IN R:    ,10(F7.0,3X)/
```

```
     7    1H  ,13(10H**********))
 7930 FORMAT(12H TOTAL USED:,19X,10F10.3/
     1    9H    AT F1:,22X,10F10.3/
     2    5X,11HAGAINST G1:,15X,10F10.3/
     3    5X,11HAGAINST G2:,15X,10F10.3/
     4    9H    AT F2:,22X,10F10.3/
     5    5X,11HAGAINST G1:,15X,10F10.3/
     6    5X,11HAGAINST G2:,15X,10F10.3/
     7    9H    AT F3:,22X,10F10.3/
     8    5X,11HAGAINST G1:,15X,10F10.3/
     9    5X,11HAGAINST G2:,15X,10F10.3//
     *    14H TOTAL LOSSES:,17X,10F10.3/
     1    23H    DUE TO LOSS OF G2F1:,8X,10F10.3/
     2    18X,5HG2F2:,8X,10F10.3/
     3    18X,5HG2F3:,8X,10F10.3/
     4    18X,4HG2R:,9X,10F10.3/
     5    18X,2HS:,11X,10F10.3/1H  ,13(10H**********))
 7940 FORMAT(14H DEMAND AT F1:,17X,10F10.3/
     1    11X,3HF2:,17X,10F10.3/
     2    11X,3HF3:,17X,10F10.3//
     3    31H MAX MOVEMENT FROM R TO F:       ,10F10.3//
     4    24H  MOVEMENT FROM R TO F1:,7X,10F10.3/
     5    21X,3HF2:,7X,10F10.3/
     6    21X,3HF3:,7X,10F10.3/1H  ,13(10H**********))
 7950 FORMAT(1H1/////21X,5(5H*****)/
     1    21X,1H*,23X,1H*/21X,1H*,A10,11H SHOWS NO G,I1,1X,1H*/
     2    21X,1H*,23X,1H*/21X,5(5H*****)///)
C
C      ******************
C      *                *
C      * R FACTOR TABLE *
C      *                *
C      ******************
C
C             INITIALIZE LOCAL VARIABLES
C
 8000 DO 8020 I=1,10
      DO 8010 J=1,26
 8010 X(J,I)=0.0
 8020 TIME(I)=0.0
C
C             DO FOR UP TO TEN DATA SETS
C
      DO 8050 I=1,10
C
C             PUT IN "VDATA" THE RATES OF CHANGE (DVA) OF THE
C             VARIABLES THEREIN.
C
      DO 8030 IKJ=1,NCV
 8030 VDATA(IKJ)=DVA(IKJ)
C
C             COMPUTE THE DESIRED DISPLAY VARIABLES FROM THE
C             APPROPRIATE DATA.
C
      TIME(I)=TT
      X(2,I)=A0401P(N,S)
      X(3,I)=A0402P(N,S)
```

```
      X(4,I)=A0403P(N,S)
      X(5,I)=A0321P(1,N,S)
      X(6,I)=A0321P(2,N,S)
      X(7,I)=A0321P(3,N,S)
      X(8,I)=A0301P(1,N,S)
      X(9,I)=A0301P(2,N,S)
      X(10,I)=V(NG1F+N,3-S)
      X(1,I)=X(2,I)+X(3,I)+X(4,I)+X(5,I)+X(6,I)+X(7,I)+X(8,I)+X(9,I)
      X(11,I)=X(1,I)*X(10,I)
      X(13,I)=A0401P(N,3-S)
      X(14,I)=A0402P(N,3-S)
      X(15,I)=A0403P(N,3-S)
      X(16,I)=A0321P(1,N,3-S)
      X(17,I)=A0321P(2,N,3-S)
      X(18,I)=A0321P(3,N,3-S)
      X(19,I)=A0301P(1,N,3-S)
      X(20,I)=A0301P(2,N,3-S)
      X(21,I)=V(NG1F+N,S)
      X(12,I)=X(13,I)+X(14,I)+X(15,I)+X(16,I)+X(17,I)+X(18,I)+X(19,I)+
     1   X(20,I)
      X(22,I)=X(12,I)*X(21,I)
      X(23,I)=X(22,I)-X(11,I)
      X(24,I)=X(11,I)+X(22,I)
      IF(X(24,I).GT.1.E-50) X(25,I)=X(23,I)/X(24,I)
      X(26,I)=C0601P(N,S)
C
C           READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT
C           TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE"
C           PARAMETER.  (NOTE:  NEW VALUES IN "VA" AND "DVA")
C
      IF(TT.GE.TEND) GO TO 8060
      DO 8050 IKJ=1,INTV
      IF(TT.GE.TEND) GO TO 8060
 8050 READ(3) TT,(XCOEF(J),J=1,NOVAR)
C
C           GENERATE THE RELEVANT PRINTOUT TABLES FOR UP TO TEN
C           TIME POINTS.
C
 8060 WRITE(6,8910) N,SIDE(S),(TIME(K),K=1,10),((X(I,J),J=1,10),I=1,11)
      WRITE(6,8920) ((X(I,J),J=1,10),I=12,26)
      GO TO 2000
 8910 FORMAT(1H1//21X,17HR FACTOR AT FRONT,I1,5X,A10////5H TIME,26X,
     1   10(F8.1,2X)/1H ,13(10H**********)/
     2   15H TOTAL G1 LOSS:,16X,10F10.3/
     3   16H LOSS DUE TO G1:,15X,10F10.3/
     4   13X,3HG3:,15X,10F10.3/
     5   13X,3HG4:,15X,10F10.3/
     6   13X,3HA1:,15X,10F10.3/
     7   13X,3HA2:,15X,10F10.3/
     8   13X,3HA3:,15X,10F10.3/
     9   13X,3HL1:,15X,10F10.3/
     *   13X,3HL2:,15X,10F10.3//
     1   11H TOTAL +G1:,20X,10F10.3//
     2   24H TOTAL LOSS * TOTAL +G1:,7X,10F10.3///)
 8920 FORMAT(16H TOTAL +G1 LOSS:,15X,10F10.3/
     1   16H LOSS DUE TO G1:,15X,10F10.3/
     2   13X,3HG3:,15X,10F10.3/
```

```
     3    13X,3HG4:,15X,10F10.3/
     4    13X,3HA1:,15X,10F10.3/
     5    13X,3HA2:,15X,10F10.3/
     6    13X,3HA3:,15X,10F10.3/
     7    13X,3HL1:,15X,10F10.3/
     8    13X,3HL2:,15X,10F10.3//
     9    10H TOTAL G1:,21X,10F10.3//
     *    24H TOTAL +LOSS * TOTAL G1:,7X,10F10.3///
     1    20H PRODUCT DIFFERENCE:,11X,10F10.3/
     2    13H PRODUCT SUM:,18X,10F10.3/
     3    18H DIFFERENCE / SUM:,13X,10F10.3//
     4    10H R FACTOR:,21X,10F10.3/1X,13(10H**********))
      END
```

```
      PROGRAM ARTOUT(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE3)
C
C          THIS PROGRAM TABULATES THE RESULTS OF A "COMBAT II"
C          RUN -- "ARTILLERY" VERSION.
C
      COMMON /XCOEF/ C0010X(2),C0020X(2),C0030X(2),C00040X(2),
     1   C0050X(2,2),C0060X(5,2),C0070X(5,2),C0211X(3,2),C0212X(3,2),
     2   C0213X(3,2),C0214X(3,2),C0215X(3,2,2),C0216X(3,5,2),
     3   C0217X(3,5,2),C0231X(2,2),C0232X(2,2),C0233X(2,2),C0234X(2,2),
     4   C0235X(2,2,2),C0236X(2,5,2),C0237X(2,5,2),C0242X(5,2),
     5   C0243X(5,2),C0244X(5,5,2),C0251X(2),C0252X(2),C0253X(2),
     6   C0254X(2),C0255X(2,2),C0256X(5,2),C0257X(5,2),C0261X(2),
     7   C0262X(2),C0263X(2),C0264X(2),C0265X(2,2),C0266X(5,2),
     8   C0267X(5,2),C0307X(2,2,2),C0511X(2),C0512X(2,2),C0513X(2,2),
     9C0521X(2),C0522X(2),C0523X(5,2),C0601X,C0603X(3,2),C0604X(2),C0605
     *X(2),C0606X(2),C0607X(2),C0610X(5,2),C0611X(5,2),C0612X(5,2),
     1   F0511X(2),E0512X(2),E0513X(2,2),E0514X(2,2),E0521X(2),
     2   F0001X(3,2),F0101X(3,2),F0102X(2),F0103X(2),F0104X(3,2),
     3   F0105X(3,2),F0106X(3,2),F0107X(3,2,2),F0108X(3,2,2),F0109X(2),
     4   F110X(5,2),F0111X(3,5,2),F0201X(3,3,2),F0202X(3,3,2),
     5   F0203X(3,15,2),F0301X(2,2),F0302X(2,3,2),
     6   F0303X(2,3,2),F0304X(2,2),F0305X(2,2),F0306X(2,2,2),
     7   F0307X(2,2),F0308X(2,2,2),F0309X(3,2,2),F0310X(2,15,2),
     8F0311X(2,5,2),F0312X(2,3,2),F0402X(5,2),F0403X(5,2),F0404X(5,5,2)
C
      COMMON /XCOEF1/ F0601X(3,2),P0001X(3,3,2),P0002X(3,3,2),
     1   P0003X(3,3,2),P0004X(3,3,2),P0101X(3,2,2),P0102X(3,2,2),
     2   P0103X(3,2),P0104X(3,2),P0105X(3,2),P0107X(3,2),P0108X(2,3,2),
     3   P0109X(2,3,2),P0110X(5,3,2)                  ,P0301X(2,2),
     4   P0302X(2,2),P0303X(2,2),P0304X(2,2),P0305X(2,2,2),P0306X(2,2),
     5   P0307X(2,2,2),P0308X(2,5,2),P0309X(2,5,2),P0323X(3,2,2),
     6   P0324X(3,2,2),P0325X(3,2,2),P0326X(3,2,4),P0327X(3,2,4),
     7   P0328X(3,5,4),P0329X(3,5,4),P0401X(2),P0402X(5,2),P0403X(5,2),
     8   P0404X(5,5,2),R0001X(3,2),R0301X(2,2),R0402X(5,2),
     9   R0571X(3,2),R0572X(2),R0573X(2),R0574X(2),R0575X(2),
     *   R0576X(5,2),R0577X(5,2),R0578X(2,2),R0579X(2,2),R0601X,
     1   R0602X(2),R0603X(2),R0604X(5,2),R0605X(5,2),R0700X(2,2),
     2   V0541X(2,2),V0545X(2,2),V0551X(5,2),V0601X(3,2),V0602X(5,3,2),
     3   V0700X(2),V0(65,2)
C
      COMMON /PV/ V(65,2),AV(30,2),VA(1760),C0001P(3,3,2),C0002P(3,3,2),
     1   C0003P(2,2),C0004P(3,2),C0601P(3,2),D0601P(3,2),D0602P(3,2),
     2   D0603P(5,3,2),D0604P(5,3,2),F0101P(3,3,2),F0104P(3,3,2),
     3   F0105P(3,3,2),F0106P(3,2),F0107P(3,2),F0108P(3,2),F0109P(3,2,2)
     4   ,F0110P(3,2,2),F0112P(3,15,2),F0113P(3,5,2),F0301P(2,3,2),
     5   F0302P(2,3,2),F0303P(2,2),F0304P(2,2),F0305P(2,2,2),F0306P(2,2)
     6   ,F0307P(2,2,2),F0308P(2,15,2),F0309P(2,5,2),P0101P(3,3,2),
     7   P0102P(3,3,2),P0103P(3,3,2),P0104P(3,3,2),P0105P(3,2),
     8   P0106P(3,2),P0108P(3,2),P0110P(3,2,2),P0111P(3,15,2),
     9   P0112P(15,3,2),P0113P(3,5,2),P0301P(2,3,2),P0302P(2,3,2),
     *   P0303P(2,2),P0304P(2,2),P0305P(2,2,2),P0306P(2,15,2),
     1   P0307P(2,5,2),P0402P(5,3,2),P0403P(5,3,2),P0404P(5,15,2),
     2   V0301P(2,2),V0541P(2,2),V0542P(2,2),V0545P(2,2),V0546P(5,3,2),
     3   V0547P(5,2),V0548P(5,3,2),V0549P(5,2),V0550P(5,2),V0601P(3,2),
     4   V0602P(5,3,2),V0603P(5,3,2)
C
      COMMON /PDV/ DV(65,2),DAV(30,2),DVA(1760)
```

```
C
      COMMON /VDATA/ A0001P(3,2),A0002P(3,2),
     1   A0101P(3,3,2),A0102P(3,3,2),A0103P(3,2),A0104P(3,2),A0105P(3,2)
     2   ,A0106P(2,3,2),A0107P(2,3,2),A0108P(15,3,2),A0109P(5,3,2),
     3   A0301P(2,3,2),A0302P(2,3,2),A0303P(2,2),A0304P(2,2),
     4   A0305P(2,2,2),A0306P(2,2),A0307P(2,3,2),A0308P(2,3,2),
     5   A0309P(2,15,2),A0310P(2,5,2),A0321P(3,3,2),A0322P(3,3,2),
     6   A0323P(3,2),A0324P(3,2),A0325P(3,2),A0326P(3,2,2),A0327P(3,3,2)
     7   ,A0328P(3,3,2),A0329P(3,15,2),A0330P(3,5,2),A0401P(3,2),
     8   A0402P(5,3,2),A0403P(5,3,2),A0404P(5,15,2),A0501P(3,2),
     9   A0502P(5,3,2),A0503P(5,2),A0511P(3,2),A0512P(3,2),A0513P(3,2),
     *   A0514P(3,2),A0515P(2),A0516P(2),A0521P(3,2),A0522P(3,2),
     1   A0523P(5,3,2),A0531P(2),A0532P(2),A0533P(2),A0534P(5,2),
     2   A0540P(2),A0541P(2,2),A0542P(2,2),A0543P(2,2),A0544P(2,2),
     3   A0551P(5,3,2),A0561P(5,2),A0571P(5,3,2),A0572P(5,2),A0573P(5,2)
     4   ,E0511P(2),E0512P(2),E0521P(3,2),E0551P(5,3,2),R0001P(3,2),
     5   R0002P(3,2),R0003P(3,2),R0004P(3,2),R0005P(2),R0301P(2,3,2),
     6  R0302P(2,3,2),R0303P(2,2),R0304P(2,2),R0305P(2,2,2),R0306P(2,2),
     7   R0307P(2,2,2),R0308P(2,15,2),R0309P(2,5,2),R0321P(3,3,2)
C
      COMMON /PPV1/ R0322P(3,3,2),R0323P(3,2),R0324P(3,2),R0325P(3,2),
     1   R0326P(3,2,2),R0327P(3,2,2),R0328P(3,15,2),R0329P(3,5,2),
     2R0402P(5,3,2),R0403P(5,3,2),R0404P(5,15,2),R0541P(2,2),R0571P(3,2)
     3  ,R0572P(2),R0573P(2),R0574P(2),R0575P(2),R0576P(5,2),R0577P(5,2)
     4   ,R0578P(2,2),R0579P(2,2),R0601P(3,2),R0602P(3,2),R0603P(5,3,2),
     5   R0604P(5,3,2)
C
C           INITIALIZE "ARTOUT" VARIABLES
C
      INTEGER S
      DIMENSION XCOFF(1),VDATA(1)
      EQUIVALENCE (VDATA(1),A0001P(1,1))
      DIMENSION DSCRPT(100,8),TITS(3)
      DIMENSION TIME(10),SIDE(2),TITLEO(6),SWT2(2),
     1   X(141,10)
      EQUIVALENCE (XCOEF(1),C0010X(1))
      DATA SIDE/10H BLUE DATA,10H  RED DATA/,ASTRK/1H*/,BLNK/1H /,
     1   NCV/1760/,NOVAR/6868/
      DATA TITS/10HRUN DESCRI,10HPTION:     ,10H          /
      DATA NG1F/0/,NG1R/4/,NW/4/,NWR/19/,NL/24/,NG2F/26/,NG2R/30/,NR/30/
     1   ,NRR/45/,NM/50/,NS/53/,NB/53/,NSB/55/,NAJ/57/,NA4/61/,NA5/62/,
     2 NXF/62/,SWTB/1/
      REWIND 3
      I=0
C
C           CHECK IF TAPE3 IS FROM THE "ARTILLERY" MODEL.  GIVE ERROR
C           MESSAGE AND STOP EXECUTION OF THE PROGRAM IF IT IS NOT.
C
      READ(3) AMODEL
      IF(AMODEL.NE.9HARTILLERY) GOTO 9980
C
C           READ FROM TAPE3 THE TITLE, DATE, DESCRIPTION AND TIME
C           RANGE OF THE "COMBAT II" RUN, CURRENTLY IN PROCESS.
C
 1000 I=I+1
      READ(3) (DSCRPT(I,K),K=1,8)
      IF(DSCRPT(I,1).NE.3HEND) GO TO 1000
```

```
      READ(3) TITLEO,DATEO,TINC,DELT,ERROR,DTINER,DTOUTR,TSTART,TEND,
     1    ALPHA
C
C             PRINT THE TITLE, DATE AND DESCRIPTION OF THE RUN.
C
      WRITE(6,2950) TITLEO,DATEO
      I=0
 1010 NTIMES=0
      WRITE(6,2952) (TITS(K),K=1,3)
 1020 NTIMES=NTIMES+1
      I=I+1
      IF(DSCRPT(I,1).EQ.3HEND) GO TO 1030
      WRITE(6,2953) (DSCRPT(I,K),K=1,8)
      IF(NTIMES.GE.25) GO TO 1010
      GO TO 1020
 1030 IDSC = I + 2
C
C             READ A CONTROL CARD AND FROM TAPE3 READ THE DATA SET
C             SELECTED BY THAT CARD.   IF THE CONTROL CARD IS A "CHANGE"
C             CARD, SET THE SWITCH "SWTB" TO THE VALUE IN THE SECOND
C             FIELD OF THE CARD (TIME1).   MAKE SURE THAT THE STARTING
C             TIME ON THE CONTROL CARD IS WITHIN THE TIME RANGE OF THE
C             "COMBAT II" DATA ON TAPE3. GIVE AN ERROR MSG IF IT IS NOT
C             AND PROCEED TO THE NEXT CONTROL CARD.
C
      READ(3) TT,(XCOEF(I),I=1,NOVAR),SWT2(1),SWT2(2)
 2000 READ(5,2990) A,TIME1,TYPE,N,S
      IF(EOF(5)) 9990,2005
 2005 IF(A.NE.6HCHANGE) GO TO 2006
      SWTB=TIME1
      GO TO 2000
 2006 IF((TIME1.LT.TSTART).OR.(TIME1.GT.TEND)) GO TO 2800
      IF(TT.LE.TIME1) GO TO 2020
      REWIND 3
      DO 2009 I=1,IDSC
 2009 READ(3) DUMMY
 2010 READ(3) TT,(XCOEF(I),I=1,NOVAR),SWT2(1),SWT2(2)
 2020 IF(TT.LT.TIME1) GO TO 2010
      DO 2021 I=1,10
 2021 TIME(I)=0.0
C
C             OBTAIN THE VALUE OF "INTV" TO DETERMINE HOW MANY DATA
C             SETS MUST BE SKIPPED OVER ON TAPE3 BEFORE THE NEXT
C             DATA SET IS READ.
C
      SWTA=0.0
      IF(A.NE.5HTYPE1) SWTA=1.0
      IF(SWTA.EQ.1.0) DECODE(7,2951,A) DUM,INTV
      INTV=INTV-1
C
C             BRANCH TO THAT PROGRAM SECTION  WHICH IS INDICATED BY
C             THE CONTROL PARAMETERS "TYPE" AND "N".
C
      IF(TYPE.EQ.1HA) GO TO 2030
      IF(TYPE.EQ.1HM) GO TO 3000
      IF(TYPE.EQ.1HB) GO TO 4000
      IF(TYPE.EQ.1HR) GO TO 8000
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      IF(TYPE.EQ.1HW) GO TO 7000
      IF(TYPE.NE.1HG) GO TO 2022
      IF(N.EQ.1) GO TO 5000
      IF(N.EQ.2) GO TO 6000
 2022 WRITE(6,2960) TYPE,N
      GO TO 2000
 9980 WRITE(6,2970) AMODEL
 9990 STOP
 2950 FORMAT(1H1//6X,*RUN NAME:*,6A10/6X,*   DATED:*,A10)
 2951 FORMAT(A4,I3)
 2952 FORMAT(1H1//16X,3A10//)
 2953 FORMAT(1X/21X,8A10)
 2960 FORMAT(//6X,*...UNKNOWN SYSTEM CODE...*,3X,1H=,A1,I1,1H=)
 2970 FORMAT(////* INCORRECT DATA ON TAPE3: *,3X,A9)
 2990 FORMAT(A10,F5.0,A1,2I1)
C
C     *************
C     *           *
C     * A TABLES  *
C     *           *
C     *************
C
C               INITIALIZE LOCAL VARIABLES
C
 2030  SKIP=0.0
      DO 2035 I=1,10
      DO 2035 J=1,86
 2035 X(J,I)=0.0
C
C               DO FOR UP TO TEN DATA SETS
C
      DO 2050 I=1,10
C
C               PUT IN "VDATA" THE INTEGRATED VALUES (VA) OR THE RATES
C               OF CHANGE (DVA) OF THE VARIABLES THEREIN, DEPENDING ON
C               WHETHER "SWTB" IS POSITIVE OR NEGATIVE RESPECTIVELY.
C
      IF(SWTB.GT.0) GO TO 2032
      DO 2031 IKJ=1,NCV
 2031 VDATA(IKJ)=DVA(IKJ)
      GO TO 2034
 2032 DO 2033 IKJ=1,NCV
 2033 VDATA(IKJ)=VA(IKJ)
 2034 CONTINUE
C
C               COMPUTE THE DESIRED DISPLAY VARIABLES FROM THE
C               APPROPRIATE DATA.
C
      TIME(I)=TT
      X(1,I)=V(NAJ+N,S)
      X(2,I)=A0514P(N,S)
      X(3,I)=R0571P(N,S)
      X(4,I)=R0001P(N,S)
      X(5,I)=R0002P(N,S)
      X(6,I)=A0001P(N,S)
      X(7,I)=R0003P(N,S)
      X(8,I)=A0002P(N,S)
```

```
      SKIP= SKIP+X(7,I)
      X(9,I)=R0004P(N,S)
      DO 2036 J=1,3
      K=(J-1)*8
      X(12+K,I)=R0321P(N,J,S)
      X(13+K,I)=R0322P(N,J,S)
      X(14+K,I)=R0328P(N,J,S)
      X(15+K,I)=R0328P(N,3+J,S)
      X(16+K,I)=R0328P(N,6+J,S)
      X(17+K,I)=R0328P(N,9+J,S)
      X(18+K,I)=R0328P(N,12+J,S)
 2036 X(11+K,I)=X(12+K,I)+X(13+K,I)+X(14+K,I)+X(15+K,I)+X(16+K,I)+
     1   X(17+K,I)+X(18+K,I)
      X(10,I)=X(11,I)+X(19,I)+X(27,I)
      X(36,I)=R0323P(N,S)
      X(37,I)=R0324P(N,S)
      X(38,I)=R0329P(N,1,S)
      X(39,I)=R0329P(N,2,S)
      X(40,I)=R0329P(N,3,S)
      X(41,I)=R0329P(N,4,S)
      X(42,I)=R0329P(N,5,S)
      X(43,I)=R0326P(N,1,S)
      X(44,I)=R0326P(N,2,S)
      X(45,I)=R0325P(N,S)
      X(46,I)=R0327P(N,1,S)
      X(47,I)=R0327P(N,2,S)
      X(35,I)=X(36,I)+X(37,I)+X(38,I)+X(39,I)+X(40,I)+X(41,I)+X(42,I)
     1   +X(43,I)+X(44,I)+X(45,I)+X(46,I)+X(47,I)
      X(48,I)=A0512P(N,S)
      DO 2037 J=1,3
      K=(J-1)*7
      X(49+K,I)=A0101P(J,N,S)
      X(50+K,I)=A0102P(J,N,S)
      X(51+K,I)=A0108P(J,N,S)
      X(52+K,I)=A0108P(3+J,N,S)
      X(53+K,I)=A0108P(6+J,N,S)
      X(54+K,I)=A0108P(9+J,N,S)
 2037 X(55+K,I)=A0108P(12+J,N,S)
      X(70,I)=A0103P(N,S)
      X(71,I)=A0104P(N,S)
      X(72,I)=A0109P(1,N,S)
      X(73,I)=A0109P(2,N,S)
      X(74,I)=A0109P(3,N,S)
      X(75,I)=A0109P(4,N,S)
      X(76,I)=A0109P(5,N,S)
      X(77,I)=A0106P(1,N,S)
      X(78,I)=A0106P(2,N,S)
      X(79,I)=A0105P(N,S)
      X(80,I)=A0107P(1,N,S)
      X(81,I)=A0107P(2,N,S)
 2040 X(82,I)=A0513P(N,S)
      X(83,I)=A0327P(1,N,S)+A0327P(2,N,S)+A0327P(3,N,S)
      X(84,I)=A0307P(1,N,S)+A0307P(2,N,S)
      X(85,I)=A0328P(1,N,S)+A0328P(2,N,S)+A0328P(3,N,S)
      X(86,I)=A0308P(1,N,S)+A0308P(2,N,S)
C
C            READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT
```

```
C               TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE"
C               PARAMETER.  (NOTE:  NEW VALUES IN "VA" AND "DVA")
C
      IF(TT.GE.TEND) GO TO 2060
      IF(SWTA.NE.1.0) GO TO 2050
      DO 2045 IKJ=1,INTV
      IF(TT.GE.TEND) GO TO 2060
 2045 READ(3) TT,(XCOEF(J),J=1,NOVAR),SWT2(1),SWT2(2)
 2050 READ(3) TT,(XCOEF(J),J=1,NOVAR),SWT2(1),SWT2(2)
C
C               GENERATE THE RELEVANT PRINTOUT TABLES FOR UP TO TEN
C               TIME POINTS.
C
 2060 WRITE(6,2910) TYPE,N,SIDE(S),(TIME(K1),K1=1,10),
     1   ((X(K2,I),I=1,10),K2=1,8)
      IF( SKIP.LE.1.E-50) GO TO 2070
      WRITE(6,2920) ((X(K,I),I=1,10),K=9,10)
      K2=10
      DO 2065 J=1,3
      K1=K2+1
      K2=K1+7
 2065 WRITE(6,2925) J,((X(K,I),I=1,10),K=K1,K2)
      WRITE(6,2927) ((X(K,I),I=1,10),K=35,48)
      K2=48
      DO 2066 J=1,3
      K1=K2+1
      K2=K1+6
 2066 WRITE(6,2930) J,((X(K,I),I=1,10),K=K1,K2)
      WRITE(6,2935) ((X(K,I),I=1,10),K=70,81)
 2070 WRITE(6,2940) ((X(K,I),I=1,10),K=82,86)
      GO TO 2000
 2800 WRITE(6,2900) TIME1,TSTART,TEND
      GO TO 2000
 2900 FORMAT(8X,4HTIME,F10.2,27H IS OUT OF DATA TIME RANGE:,F7.2,
     +4H TO,F7.2)
 2910 FORMAT(1H1//21X,7HSYSTEM:,A1,I1,5X,A10 ////5H TIME,26X,10(F8.1,2X)
     1   /1H ,13(10H**********)/
     2   7H TOTAL:,24X,10F10.3/
     3   13H NUMBER LOST:,18X,10F10.3/
     4   10H RESUPPLY:,21X,10F1[illegible]X,13(10H**********)/
     5   16H TOTAL LAUNCHED:,1[illegible]0.3//
     6   13H AA LAUNCHED:,18X,1[illegible].3/
     7   22H AA LOSSES DUE TO +AA:,9X,10F10.3//
     8   13H AG LAUNCHED:,18X,10F10.3/
     9   22H AG LOSSES DUE TO +AA:, 9X,10F10.3/1H ,13(10H**********))
 2920 FORMAT(31H AG SURVIVING THE AIR BATTLE:  ,10F10.3//
     1   22H AG SENT TO THE FRONT:,9X,10F10.3)
 2925 FORMAT(9X,4HTO F,I1,1H:,16X,10F10.3/
     1   15X,12HAGAINST G1F:,4X,10F10.3/
     2   15X,12HAGAINST G2F:,4X,10F10.3/
     3   15X,12HAGAINST W1F:,4X,10F10.3/
     4   15X,12HAGAINST W2F:,4X,10F10.3/
     5   15X,12HAGAINST W3F:,4X,10F10.3/
     6   15X,12HAGAINST W4F:,4X,10F10.3/
     7   15X,12HAGAINST W5F:,4X,10F10.3/)
 2927 FORMAT(21H AG SENT TO THE REAR:,10X,10F10.3/
     2   11X,12HAGAINST G1R:,8X,10F10.3/
```

```
     3    11X,12HAGAINST G2R:,8X,10F10.3/
     *    11X,12HAGAINST W1R:,8X,10F10.3/
     *    11X,12HAGAINST W2R:,8X,10F10.3/
     *    11X,12HAGAINST W3R:,8X,10F10.3/
     *    11X,12HAGAINST W4R:,8X,10F10.3/
     *    11X,12HAGAINST W5R:,8X,10F10.3/
     4    11X,11HAGAINST L1:,9X,10F10.3/
     5    11X,11HAGAINST L2:,9X,10F10.3/
     6    11X,10HAGAINST S:,10X,10F10.3/
     7    11X,11HAGAINST B1:,9X,10F10.3/
     8    11X,11HAGAINST B2:,9X,10F10.3/1H ,13(10H**********)/
     9    25H AG LOST TO AIR DEFENSES:,6X,10F10.3/)
 2930 FORMAT(17H LOSSES IN FRONT ,I1,13H DUE TO G1F: ,10F10.3/
     1    18X,13H DUE TO G2F: ,10F10.3/
     2    18X,13H DUE TO W1F: ,10F10.3/
     3    18X,13H DUE TO W2F: ,10F10.3/
     4    18X,13H DUE TO W3F: ,10F10.3/
     5    18X,13H DUE TO W4F: ,10F10.3/
     6    18X,13H DUE TO W5F: ,10F10.3/)
 2935 FORMAT(20H LOSSES DUE TO  G1R:,11X,10F10.3/
     8    16X,4HG2R:,11X,10F10.3/
     *    16X,4HW1R:,11X,10F10.3/
     *    16X,4HW2R:,11X,10F10.3/
     *    16X,4HW3R:,11X,10F10.3/
     *    16X,4HW4R:,11X,10F10.3/
     *    16X,4HW5R:,11X,10F10.3/
     9    17X,3HL1:,11X,10F10.3/
     *    17X,3HL2:,11X,10F10.3/
     1    18X,2HS:,11X,10F10.3/
     2    17X,3HB1:,11X,10F10.3/
     3    17X,3HB2:,11X,10F10.3/1H ,13(10H**********))
 2940 FORMAT(26H TOTAL LOST ON THE GROUND:,5X,10F10.3//
     1    25H LOSSES AT B1 DUE TO +AG:,6X,10F10.3/
     2    24H LOSSES AT B1 DUE TO +M:,7X,10F10.3/
     3    25H LOSSES AT B2 DUE TO +AG:,6X,10F10.3/
     4    24H LOSSES AT B2 DUE TO +M:,7X,10F10.3/1H ,13(10H**********))
C
C      ************
C      *          *
C      * M TABLES *
C      *          *
C      ************
C
 3000 DO 3060 I=1,2
C
C             PROCESS SYSTEM "M1" AND THEN "M2".
C
      IF(I.EQ.1) GO TO 3005
C
C             WHEN SYSTEM "M2" IS IN PROCESS READ FROM TAPE3 A SET OF
C             "COMBAT II" DATA CORRESPONDING TO THE "TIME1" CONTROL
C             PARAMETER AND TO THE TYPE OF OUTPUT TABLES SELECTED
C             IN THE LAST CONTROL CARD.
C
      REWIND 3
      DO 3006 IK=1,IDSC
 3006 READ(3) DUMMY
```

```
3001 READ(3) TT,(XCOEF(IK),IK=1,NOVAR),SWT2(1),SWT2(2)
     IF(TT.LT.TIME1) GO TO 3001
3005 CONTINUE
C
C             INITIALIZE LOCAL VARIABLES
C
     DO 3010 J=1,52
     DO 3010 K=1,10
      TIME(K)=0.0
3010 X(J,K)=0.0
      SKIP=0.0
C
C             DO FOR UP TO TEN DATA SETS
C
     DO 3030 J=1,10
C
C             PUT IN "VDATA" THE INTEGRATED VALUES (VA) OR THE RATES
C             OF CHANGE (DVA) OF THE VARIABLES THEREIN, DEPENDING ON
C             WHETHER "SWTB" IS POSITIVE OR NEGATIVE RESPECTIVELY.
C
     IF(SWTB.GT.0) GO TO 3012
     DO 3011 IKJ=1,NCV
3011 VDATA(IKJ)=DVA(IKJ)
     GO TO 3014
3012 DO 3013 IKJ=1,NCV
3013 VDATA(IKJ)=VA(IKJ)
3014 CONTINUE
C
C             COMPUTE THE DESIRED DISPLAY VARIABLES FROM THE
C             APPROPRIATE DATA.
C
     TIME(J)=TT
     X(1,J)=V(NM+I,S)
     X(2,J)=R0541P(I,S)+A0542P(I,S)+A0543P(I,S)+A0544P(I,S)
     X(3,J)=R0578P(I,S)
     X(4,J)=V(NL+I,S)
     X(5,J)=A0541P(I,S)
     X(6,J)=R0578X(I,S)
     X(7,J)=V(NS,S)
     X(8,J)=A0540P(S)
      SKIP= SKIP+X(4,J)
     IF(X(7,J).GT.1.E-20) X(9,J)=V0542P(I,S)/X(7,J)
     X(10,J)=V0545P(I,S)
     X(11,J)=V0541P(I,S)
     X(12,J)=R0541P(I,S)
     DO  3015 K=1,3
     L=(K-1)*7
     X(13+L,J)=R0301P(I,K,S)
     X(14+L,J)=R0302P(I,K,S)
     X(15+L,J)=R0308P(I,K,S)
     X(16+L,J)=R0308P(I,3+K,S)
     X(17+L,J)=R0308P(I,6+K,S)
     X(18+L,J)=R0308P(I,9+K,S)
3015 X(19+L,J)=R0308P(I,12+K,S)
     X(34,J)=R0303P(I,S)
     X(35,J)=R0304P(I,S)
     X(36,J)=R0309P(I,1,S)
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```
      X(37,J)=R0309P(I,2,S)
      X(38,J)=R0309P(I,3,S)
      X(39,J)=R0309P(I,4,S)
      X(40,J)=R0309P(I,5,S)
      X(41,J)=R0305P(I,1,S)
      X(42,J)=R0305P(I,2,S)
      X(43,J)=R0306P(I,S)
      X(44,J)=R0307P(I,1,S)
      X(45,J)=R0307P(I,2,S)
      X(46,J)=A0542P(I,S)+A0543P(I,S)+A0544P(I,S)
      X(53,J)=A0543P(I,S)
      X(54,J)=A0541P(I,S)
      X(55,J)=A0305P(1,I,S)
      X(56,J)=A0305P(2,I,S)
      X(57,J)=A0326P(1,I,S)
      X(58,J)=A0326P(2,I,S)
      X(59,J)=A0326P(3,I,S)
      X(60,J)=A0542P(I,S)
      X(61,J)=A0532P(S)
      X(62,J)=A0544P(I,S)
 3020 X(47,J)=A0540P(S)
      X(48,J)=A0306P(1,S)
      X(49,J)=A0306P(2,S)
      X(50,J)=A0325P(1,S)
      X(51,J)=A0325P(2,S)
      X(52,J)=A0325P(3,S)
C
C             READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT
C             TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE"
C             PARAMETER.  (NOTE:  NEW VALUES IN "VA" AND "DVA")
C
      IF(TT.GE.TEND) GO TO 3040
      IF(SWTA.NE.1.0) GO TO 3030
      DO 3025 IKJ=1,INTV
      IF(TT.GE.TEND) GO TO 3040
 3025 READ(3) TT,(XCOEF(K),K=1,NOVAR),SWT2(1),SWT2(2)
 3030 READ(3) TT,(XCOEF(K),K=1,NOVAR),SWT2(1),SWT2(2)
C
C             IF SOME LAUNCHERS ARE STILL FUNCTIONING OR THE SYSTEM IN
C             PROCESS IS "M1",  GENERATE BLOCKS OF PRINTOUT CONTAINING
C             THE VALUES OF SELECTED VARIABLES FOR UP TO TEN TIME POINTS.
C             IN ANY CASE, OMIT CERTAIN BLOCKS IF THERE ARE NO
C             FUNCTIONING LAUNCHERS.
C
 3040 IF(( SKIP.LE.1.E-50).AND.(I.EQ.2)) GO TO 2000
      WRITE(6,3910) I,SIDE(S),(TIME(K),K=1,10),((X(K1,K),K=1,10),K1=1,8)
      WRITE(6,3920) ((X(K1,K),K=1,10),K1=9,12)
      IF(SKIP.LE.1.E-20) GO TO 3050
      K3=12
      DO 3045 J=1,3
      K2=K3+1
      K3=K2+6
 3045 WRITE(6,3930) J,((X(K1,K),K=1,10),K1=K2,K3)
      WRITE(6,3935) ((X(K1,K),K=1,10),K1=34,46)
 3050 WRITE(6,3940) ((X(K1,K),K=1,10),K1=47,52)
      IF(SKIP.LE.1.E-20) GO TO 3060
      WRITE(6,3950) ((X(K1,K),K=1,10),K1=53,62)
```

```
3060 WRITE(6,3960)
     GO TO 2000
3910 FORMAT(1H1//21X,8HSYSTEM:M,I1,5X,A10////5H TIME,26X,10(F8.1,2X)/
    1     1H ,13(10H**********)/
    2     7H TOTAL:,24X,10F10.3/
    3     21H NUMBER LOST OR USED:,10X,10F10.3/
    4     10H RESUPPLY:,21X,10F10.3//
    5     9H TOTAL L:,22X,10F10.3/
    6     13H NUMBER LOST:,18X,10F10.3/
    7     10H RESUPPLY:,21X,10F10.3//
    8     9H TOTAL S:,22X,10F10.3/
    9     13H NUMBER LOST:,18X,10F10.3/1H ,13(10H**********))
3920 FORMAT(16H NUMBER M PER S:,15X,10F10.3/
    1     31H NUMBER IN TRANSIT IN REAR:     ,10F10.3/
    2     14H NUMBER PER L:,17X,10F10.3/1X,13(10H**********)/
    3     18H TOTAL M LAUNCHED:,13X,10F10.3/)
3930 FORMAT(26H NUMBER LAUNCHED IN FRONT ,I1/18X,13HAGAINST G1F: ,
    1     10F10.3/26X,5HG2F: ,10F10.3/
    2     26X,5HW1F: ,10F10.3/
    3     26X,5HW2F: ,10F10.3/
    4     26X,5HW3F: ,10F10.3/
    5     26X,5HW4F: ,10F10.3/
    6     26X,5HW5F: ,10F10.3)
3935 FORMAT(1X/10X,21HIN REAR AGAINST G1R: ,10F10.3/
    8     26X,5HG2R: ,10F10.3/
    *     26X,5HW1R: ,10F10.3/
    *     26X,5HW2R: ,10F10.3/
    *     26X,5HW3R: ,10F10.3/
    *     26X,5HW4R: ,10F10.3/
    *     26X,5HW5R: ,10F10.3/
    9     27X,4HL1: ,10F10.3/
    *     27X,4HL2: ,10F10.3/
    1     28X,3HS: ,10F10.3/
    2     27X,4HB1: ,10F10.3/
    3     27X,4HB2: ,10F10.3/1H ,13(10H**********)/
    4     16H TOTAL M LOSSES:,15X,10F10.3/)
3940 FORMAT(16H TOTAL S LOSSES:,15X,10F10.3/
    1     11H DUE TO M1:,20X,10F10.3/
    2     8X,3HM2:,20X,10F10.3/
    3     8X,3HA1:,20X,10F10.3/
    4     8X,3HA2:,20X,10F10.3/
    5     8X,3HA3:,20X,10F10.3)
3950 FORMAT(26H M LOSSES DUE TO S LOSSES:,5X,10F10.3//
    1     16H TOTAL L LOSSES:,15X,10F10.3/
    2     11H DUE TO M1:,20X,10F10.3/
    3     8X,3HM2:,20X,10F10.3/
    4     8X,3HA1:,20X,10F10.3/
    5     8X,3HA2:,20X,10F10.3/
    6     8X,3HA3:,20X,10F10.3/
    7     26H M LOSSES DUE TO L LOSSES:,5X,10F10.3//
    8     21H TOTAL G2R ATTRITION:,10X,10F10.3/
    9     31H M LOSSES DUE TO G2R LOSSES:    ,10F10.3)
3960 FORMAT(1H ,13(10H**********))
C
C       ************
C       *          *
C       * B TABLES *
```

```
C       *           *
C       ************
C
C               INITIALIZE LOCAL VARIABLES
C
 4000 DO 4020 I=1,10
      DO 4010 J=1,26
 4010 X(J,I)=0.0
      X(28,I)=0.0
      X(29,I)=0.0
 4020 X(27,I)=BLNK
C
C               DO FOR UP TO TEN DATA SETS
C
      DO 4040 I=1,10
      TIME(I)=TT
C
C               PUT IN "VDATA" THE INTEGRATED VALUES (VA) OR THE RATES
C               OF CHANGE (DVA) OF THE VARIABLES THEREIN, DEPENDING ON
C               WHETHER "SWTB" IS POSITIVE OR NEGATIVE RESPECTIVELY.
C
      IF(SWTB.GT.0) GO TO 4022
      DO 4021 IKJ=1,NCV
 4021 VDATA(IKJ)=DVA(IKJ)
      GO TO 4024
 4022 DO 4023 IKJ=1,NCV
 4023 VDATA(IKJ)=VA(IKJ)
 4024 CONTINUE
C
C               COMPUTE THE DESIRED DISPLAY VARIABLES FROM THE
C               APPROPRIATE DATA.
C
      DO 4030 J=1,2
      K=(J-1)*9
      X(1+K,I)=V(NB+J,S)
      IF(X(1+K,I).LE.1.E-50) GO TO 4029
      X(3+K,I)=F0309X(1,J,S)*V(NAJ+1,S)/X(1+K,I)
      X(4+K,I)=F0309X(2,J,S)*V(NAJ+2,S)/X(1+K,I)
      X(5+K,I)=F0309X(3,J,S)*V(NAJ+3,S)/X(1+K,I)
 4029 CONTINUE
      X(2+K,I)=X(3+K,I)+X(4+K,I)+X(5+K,I)
      X(6+K,I)=C0003P(J,S)
      X(7+K,I)=C0004P(1,S)
      X(8+K,I)=C0004P(2,S)
      X(27+J,I)=V(NSB+J,S)
 4030 X(9+K,I)=C0004P(3,S)
      X(19,I)=V(NA4,S)
      X(20,I)=E0511P(S)
      X(21,I)=A0515P(S)
      X(22,I)=R0572P(S)
      X(23,I)=V(NA5,S)
      X(24,I)=E0512P(S)
      X(25,I)=A0516P(S)
      X(26,I)=R0572P(S)
C
C               READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT
C               TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE"
```

```
C             PARAMETER.  (NOTE:  NEW VALUES IN "VA" AND "DVA")
C
      IF(SWT2(S).EQ.1) X(27,I)=ASTRK
      IF(TT.GE.TEND) GO TO 4050
      IF(SWTA.NE.1.0) GO TO 4040
      DO 4035 IKJ=1,INTV
      IF(TT.GE.TEND) GO TO 4050
 4035 READ(3) TT,(XCOEF(J),J=1,NOVAR),SWT2(1),SWT2(2)
 4040 READ(3) TT,(XCOEF(K),K=1,NOVAR),SWT2(1),SWT2(2)
C
C             GENERATE THE RELEVANT PRINTOUT TABLES FOR UP TO TEN
C             TIME POINTS.
C
 4050 WRITE(6,4910) SIDE(S),(TIME(I),I=1,10)
      DO 4060 I=1,2
      K1=(I-1)*9+1
      K2=K1+8
      K3=K1+4
      K4=K3+1
      K5=27+I
 4060 WRITE(6,4920) I,((X(J,L),L=1,10),J=K1,K3),(X(K5,L),L=1,10),
     1   ((X(J,L),L=1,10),J=K4,K2)
      WRITE(6,4930)((X(J,I),I=1,10),J=19,27)
      GO TO 2000
 4910 FORMAT(1H1//21X,8HSYSTEM:B,6X,A10////5H TIME,26X,10(F8.1,2X)
     1   /1H ,13(10H**********))
 4920 FORMAT(3H (B,I1,1H)/
     1   7H TOTAL:,24X,10F10.3/
     2   17H NUMBER AC PER B:,14X,10F10.3/
     3   8X,9HA1 PER B:,14X,10F10.3/
     4   8X,9HA2 PER B:,14X,10F10.3/
     5   8X,9HA3 PER B:,14X,10F10.3//
     *   19H UNREPAIRED DAMAGE:,12X,10F10.3/
     6   20H DEGRADATION FACTOR:,11X,10F10.3/
     7   31H A1 LAUNCH RATE DEGRADATION:    ,10F10.3/
     8   31H A2 LAUNCH RATE DEGRADATION:    ,10F10.3/
     9   31H A3 LAUNCH RATE DEGRADATION:    ,10F10.3/1H ,
     *   13(10H**********))
 4930 FORMAT(10H TOTAL A4:,21X,10F10.3/
     1   13H NUMBER USED:,18X,10F10.3/
     2   23H NUMBER LOST ON GROUND:,8X,10F10.3/
     3   10H RESUPPLY:,21X,10F10.3//
     4   10H TOTAL A5:,21X,10F10.3/
     5   13H NUMBER USED:,18X,10F10.3/
     6   23H NUMBER LOST ON GROUND:,8X,10F10.3/
     7   10H RESUPPLY:,21X,10F10.3/1X,13(10H**********)//
     8   15H HOURS USING A5,16X,10(6X,A1,3X)//1H ,13(10H**********))
C
C     *************
C     *           *
C     * G1 TABLES *
C     *           *
C     *************
C
C             INITIALIZE LOCAL VARIABLES
C
 5000 DO 5020 I=1,10
```

```
      DO 5010 J=1,141
 5010 X(J,I)=0.0
 5020 TIME(I)=0.0
C
C              DO FOR UP TO TEN DATA SETS
C
      DO 5050 I=1,10
C
C              PUT IN "VDATA" THE INTEGRATED VALUES (VA) OR THE RATES
C              OF CHANGE (DVA) OF THE VARIABLES THEREIN, DEPENDING ON
C              WHETHER "SWTB" IS POSITIVE OR NEGATIVE RESPECTIVELY.
C
      IF(SWTB.GT.0) GO TO 5022
      DO 5021 IKJ=1,NCV
 5021 VDATA(IKJ)=DVA(IKJ)
      GO TO 5024
 5022 DO 5023 IKJ=1,NCV
 5023 VDATA(IKJ)=VA(IKJ)
 5024 CONTINUE
C
C              COMPUTE THE DESIRED DISPLAY VARIABLES FROM THE
C              APPROPRIATE DATA.
C
      TIME(I)=TT
      X(2,I)=V(NG1F+1,S)
      X(3,I)=V(NG1F+2,S)
      X(4,I)=V(NG1F+3,S)
      X(5,I)=V(NG1R,S)
      X(1,I)=X(2,I)+X(3,I)+X(4,I)+X(5,I)
      X(7,I)=A0501P(1,S)
      X(8,I)=A0501P(2,S)
      X(9,I)=A0501P(3,S)
      X(10,I)=A0531P(S)
      X(6,I)=X(7,I)+X(8,I)+X(9,I)+X(10,I)
      X(11,I)=R0574P(S)
      X(13,I)=R0601P(1,S)
      X(14,I)=R0601P(2,S)
      X(15,I)=R0601P(3,S)
      X(12,I)=X(13,I)+X(14,I)+X(15,I)
      X(16,I)=V(NXF+1,S)
      X(17,I)=V(NXF+2,S)
      X(18,I)=V(NXF+3,S)
      X(19,I)=C0601X
      X(20,I)=R0601X
      X(21,I)=C0601P(1,S)
      X(22,I)=C0601P(2,S)
      X(23,I)=C0601P(3,S)
      X(24,I)=F0601X(1,S)
      X(25,I)=F0601X(2,S)
      X(26,I)=F0601X(3,S)
      X(27,I)=DV(NXF+1,S)
      X(28,I)=DV(NXF+2,S)
      X(29,I)=DV(NXF+3,S)
      DO 5030 J=1,3
      K=(J-1)*12
      X(30+K,I)=A0501P(J,S)
      X(31+K,I)=A0401P(J,S)
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```
      X(32+K,I)=A0402P(1,J,S)
      X(33+K,I)=A0402P(2,J,S)
      X(34+K,I)=A0402P(3,J,S)
      X(35+K,I)=A0402P(4,J,S)
      X(36+K,I)=A0402P(5,J,S)
      X(37+K,I)=A0301P(1,J,S)
      X(38+K,I)=A0301P(2,J,S)
      X(39+K,I)=A0321P(1,J,S)
      X(40+K,I)=A0321P(2,J,S)
 5030 X(41+K,I)=A0321P(3,J,S)
      X(66,I)=A0531P(S)
      X(67,I)=A0303P(1,S)
      X(68,I)=A0303P(2,S)
      X(69,I)=A0323P(1,S)
      X(70,I)=A0323P(2,S)
      X(71,I)=A0323P(3,S)
      DO 5040 J=1,3
      X(71+J,I)=D0601P(J,S)
      X(74+J,I)=V0601X(J,S)
 5040 X(78+J,I)=R0601P(J,S)
      X(78,I)=R0602X(S)
      K=3-S
      DO 5042 J=1,30
      X(81+J,I)=V(J,K)
 5042 X(111+J,I)=AV(J,S)
C
C              READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT
C              TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE"
C              PARAMETER.  (NOTE:  NEW VALUES IN "VA" AND "DVA")
C
      IF(TT.GE.TEND) GO TO 5060
      IF(SWTA.NE.1.0) GO TO 5050
      DO 5045 IKJ=1,INTV
      IF(TT.GE.TEND) GO TO 5060
 5045 READ(3) TT,(XCOEF(J),J=1,NOVAR),SWT2(1),SWT2(2)
 5050 READ(3) TT,(XCOEF(J),J=1,NOVAR),SWT2(1),SWT2(2)
C
C              GENERATE THE RELEVANT PRINTOUT TABLES FOR UP TO TEN
C              TIME POINTS.
C
 5060 WRITE(6,5910) SIDE(S),(TIME(I),I=1,10),((X(J,I),I=1,10),J=1,15)
      WRITE(6,5920) ((X(J,I),I=1,10),J=16,29)
      K2=29
      DO 5070 K=1,3
      K1=K2+1
      K2=K1+11
 5070 WRITE(6,5930) K,((X(J,I),I=1,10),J=K1,K2)
      WRITE(6,5940) ((X(J,I),I=1,10),J=66,71)
      WRITE(6,5950) ((X(J,I),I=1,10),J=72,81)
      WRITE(6,5960) ((X(J,I),I=1,10),J=82,111)
      WRITE(6,5961) ((X(J,I),I=1,10),J=112,141)
      GO TO 2000
 5910 FORMAT(1H1//21X,9HSYSTEM:G1,5X,A10////5H TIME,26X,10(F8.1,2X)/
     1   1H ,13(10H**********)/
     2   7H TOTAL:,24X,10F10.3/
     3   9H   AT F1:,22X,10F10.3/
     4   9H   AT F2:,22X,10F10.3/
```

```
     5    9H    AT F3:,22X,10F10.3/
     6    8H    IN R:,23X,10F10.3//
     7    14H TOTAL LOSSES:,17X,10F10.3/
     8     9H    AT F1:,22X,10F10.3/
     9     9H    AT F2:,22X,10F10.3/
     *     9H    AT F3:,22X,10F10.3/
     1     8H    IN R:,23X,10F10.3//
     2   10H RESUPPLY:,21X,10F10.3//
     3    17H MOVEMENT R TO F:,14X,10F10.3/
     4    9H    TO F1:,22X,10F10.3/
     5    9H    TO F2:,22X,10F10.3/
     6    9H    TO F3:,22X,10F10.3/1H ,13(10H**********))
 5920 FORMAT(20H FEBA POSITION (F1):,11X,10F10.3/
     1    15X,5H(F2):,11X,10F10.3/
     2    15X,5H(F3):,11X,10F10.3//
     3    31H SHAPING FACTOR FOR FEBA MOVE: ,10F10.3//
     4    24H MAX FEBA MOVEMENT RATE:,7X,10F10.3//
     5    31H R FACTOR FOR FEBA MOVE (F1):  ,10F10.3/
     6    24X,7H(F2):  ,10F10.3/
     7    24X,7H(F3):  ,10F10.3//
     8    30H FRACTION OF MAX FEBA MOVEMENT/
     9    20H     COMMANDED BY F1:,11X,10F10.3/
     *    17X,3HF2:,11X,10F10.3/
     1    17X,3HF3:,11X,10F10.3//
     2    18H FEBA RATE  AT F1:,13X,10F10.3/
     3    15X,3HF2:,13X,10F10.3/
     4    15X,3HF3:,13X,10F10.3/1H ,13(10H**********))
 5930 FORMAT(12H LOSSES AT F,I1,1H:,17X,10F10.3/
     1    14H     DUE TO G1:,17X,10F10.3/
     2    11X,3HW1:,17X,10F10.3/
     *    11X,3HW2:,17X,10F10.3/
     *    11X,3HW3:,17X,10F10.3/
     *    11X,3HW4:,17X,10F10.3/
     3    11X,3HW5:,17X,10F10.3/
     4    11X,3HM1:,17X,10F10.3/
     5    11X,3HM2:,17X,10F10.3/
     6    11X,3HA1:,17X,10F10.3/
     7    11X,3HA2:,17X,10F10.3/
     8    11X,3HA3:,17X,10F10.3/)
 5940 FORMAT(13H LOSSES IN R:,18X,10F10.3/
     1    14H     DUE TO M1:,17X,10F10.3/
     2    11X,3HM2:,17X,10F10.3/
     3    11X,3HA1:,17X,10F10.3/
     4    11X,3HA2:,17X,10F10.3/
     5    11X,3HA3:,17X,10F10.3/1H ,13(10H**********))
 5950 FORMAT(21H DEMAND FOR G1 IN F1:,10X,10F10.3/
     1    18X,3HF2:,10X,10F10.3/
     2    18X,3HF3:,10X,10F10.3//
     3    25H MAXIMUM USABLE G1 AT F1:,6X,10F10.3/
     4    22X,3HF2:,6X,10F10.3/
     5    22X,3HF3:,6X,10F10.3//
     6    31H MAXIMUM MOVEMENT OF G1 R TO F:,10F10.3//
     7    24H MOVEMENT OF G1 R TO F1:,7X,10F10.3/
     8    21X,3HF2:,7X,10F10.3/
     9    21X,3HF3:,7X,10F10.3/1H ,13(10H**********))
 5960 FORMAT(1X///1X,13(10H**********)/
     1    46X,22HCENTRAL COMMAND SYSTEM/1X,13(10H**********)/
```

```
     2    24H NUMBER OF TARGETS, TYPE=/
     3    19X,5HG1F1:,7X,10F10.3/19X,5HG1F2:,7X,10F10.3/
     4    19X,5HG1F3:,7X,10F10.3/20X,4HG1R:,7X,10F10.3/
     5    19X,5HW1F1:,7X,10F10.3/19X,5HW1F2:,7X,10F10.3/
     6    19X,5HW1F3:,7X,10F10.3/19X,5HW2F1:,7X,10F10.3/
     7    19X,5HW2F2:,7X,10F10.3/19X,5HW2F3:,7X,10F10.3/
     8    19X,5HW3F1:,7X,10F10.3/19X,5HW3F2:,7X,10F10.3/
     9    19X,5HW3F3:,7X,10F10.3/19X,5HW4F1:,7X,10F10.3/
     *    19X,5HW4F2:,7X,10F10.3/19X,5HW4F3:,7X,10F10.3/
     1    19X,5HW5F1:,7X,10F10.3/19X,5HW5F2:,7X,10F10.3/
     2    19X,5HW5F3:,7X,10F10.3/20X,4HW1R:,7X,10F10.3/
     3    20X,4HW2R:,7X,10F10.3/20X,4HW3R:,7X,10F10.3/
     4    20X,4HW4R:,7X,10F10.3/20X,4HW5R:,7X,10F10.3/
     5    21X,3HL1:,7X,10F10.3/21X,3HL2:,7X,10F10.3/
     6    19X,5HG2F1:,7X,10F10.3/ 19X,5HG2F2:,7X,10F10.3/
     7    19X,5HG2F3:,7X,10F10.3/20X,4HG2R:,7X,10F10.3//)
 5961 FORMAT(28H NUMBER OF ACQUIRED TARGETS=/
     1    19X,5HG1F1:,7X,10F10.3/19X,5HG1F2:,7X,10F10.3/
     2    19X,5HG1F3:,7X,10F10.3/20X,4HG1R:,7X,10F10.3/
     3    19X,5HW1F1:,7X,10F10.3/19X,5HW1F2:,7X,10F10.3/
     4    19X,5HW1F3:,7X,10F10.3/19X,5HW2F1:,7X,10F10.3/
     5    19X,5HW2F2:,7X,10F10.3/19X,5HW2F3:,7X,10F10.3/
     6    19X,5HW3F1:,7X,10F10.3/19X,5HW3F2:,7X,10F10.3/
     7    19X,5HW3F3:,7X,10F10.3/19X,5HW4F1:,7X,10F10.3/
     8    19X,5HW4F2:,7X,10F10.3/19X,5HW4F3:,7X,10F10.3/
     9    19X,5HW5F1:,7X,10F10.3/19X,5HW5F2:,7X,10F10.3/
     *    19X,5HW5F3:,7X,10F10.3/20X,4HW1R:,7X,10F10.3/
     1    20X,4HW2R:,7X,10F10.3/20X,4HW3R:,7X,10F10.3/
     2    20X,4HW4R:,7X,10F10.3/20X,4HW5R:,7X,10F10.3/
     3    21X,3HL1:,7X,10F10.3/21X,3HL2:,7X,10F10.3/
     4    19X,5HG2F1:,7X,10F10.3/19X,5HG2F2:,7X,10F10.3/
     5    19X,5HG2F3:,7X,10F10.3/20X,4HG2R:,7X,10F10.3/
     6    1X,13(10H**********))
C
C       *************
C       *           *
C       * G2 TABLES *
C       *           *
C       *************
C
C               INITIALIZE LOCAL VARIABLES
C
 6000 DO 6020 I=1,10
      DO 6010 J=1,73
 6010 X(J,I)=0.0
 6020 TIME(I)=0.0
      SWTC=0
      IF(S.GT.2) SWTC=1
      IF(S.GT.2) S=S-2
C
C               DO FOR UP TO TEN DATA SETS
C
      DO 6060 I=1,10
C
C               PUT IN "VDATA" THE INTEGRATED VALUES (VA) OR THE RATES
C               OF CHANGE (DVA) OF THE VARIABLES THEREIN, DEPENDING ON
C               WHETHER "SWTB" IS POSITIVE OR NEGATIVE RESPECTIVELY.
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C
      IF(SWTB.GT.0) GO TO 6022
      DO 6021 IKJ=1,NCV
 6021 VDATA(IKJ)=DVA(IKJ)
      GO TO 6024
 6022 DO 6023 IKJ=1,NCV
 6023 VDATA(IKJ)=VA(IKJ)
 6024 CONTINUE
C
C              COMPUTE THE DESIRED DISPLAY VARIABLES FROM THE
C              APPROPRIATE DATA.
C
      TIME(I)=TT
      Q=24.0*E0521X(S)
      DO 6030 J=1,3
      X(1+J,I)=V(NG2F+J,S)
      IF(SWTC.NE.1) X(1+J,I)=DIVIDE(X(1+J,I),V(NG1F+J,S)*Q)
      X(6+J,I)=A0521P(J,S)+A0522P(J,S)+E0521P(J,S)
 6030 X(13+J,I)=R0602P(J,S)
      X(5,I)=V(NG2R,S)
      IF(SWTC.NE.1) X(5,I)=DIVIDE(X(5,I),Q*V(NG1R,S))
      X(10,I)=A0532P(S)+A0533P(S)
      X(1,I)=X(2,I)+X(3,I)+X(4,I)+X(5,I)
      IF(SWTC.NE.1) X(1,I)=DIVIDE(V(NG2F+1,S)+V(NG2F+2,S)+V(NG2F+3,S)+
     1   V(NG2R,S),Q*(V(NG1F+1,S)+V(NG1F+2,S)+V(NG1F+3,S)+V(NG1R,S)))
      X(6,I)=X(7,I)+X(8,I)+X(9,I)+X(10,I)
      X(11,I)=C0607X(S)
      X(12,I)=R0575P(S)
      X(13,I)=X(14,I)+X(15,I)+X(16,I)
      X(17,I)=A0521P(1,S)+A0521P(2,S)+A0521P(3,S)+A0532P(S)
      DO 6040 J=1,3
      K=(J-1)*11
      X(18+K,I)=A0521P(J,S)
      X(19+K,I)=A0403P(1,J,S)
      X(20+K,I)=A0403P(2,J,S)
      X(21+K,I)=A0403P(3,J,S)
      X(22+K,I)=A0403P(4,J,S)
      X(23+K,I)=A0403P(5,J,S)
      X(24+K,I)=A0302P(1,J,S)
      X(25+K,I)=A0302P(2,J,S)
      X(26+K,I)=A0322P(1,J,S)
      X(27+K,I)=A0322P(2,J,S)
 6040 X(28+K,I)=A0322P(3,J,S)
      X(51,I)=A0532P(S)
      X(52,I)=A0304P(1,S)
      X(53,I)=A0304P(2,S)
      X(54,I)=A0324P(1,S)
      X(55,I)=A0324P(2,S)
      X(56,I)=A0324P(3,S)
      X(58,I)=E0521P(1,S)+A0522P(1,S)
      X(59,I)=E0521P(2,S)+A0522P(2,S)
      X(60,I)=E0521P(3,S)+A0522P(3,S)
      X(61,I)=A0533P(S)
      X(57,I)=X(58,I)+X(59,I)+X(60,I)+X(61,I)
      X(62,I)=C0606X(S)
      X(63,I)=E0521X(S)
      DO 6050 J=1,3
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      X(63+J,I)=D0602P(J,S)
      X(70+J,I)=C0522X(S)*V(NG1F+J,S)
 6050 X(67+J,I)=R0602P(J,S)
      X(67,I)=R0603X(S)
C
C              READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT
C              TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE"
C              PARAMETER.  (NOTE:  NEW VALUES IN "VA" AND "DVA")
C
      IF(TT.GE.TEND) GO TO 6070
      IF(SWTA.NE.1.0) GO TO 6060
      DO 6055 IKJ=1,INTV
      IF(TT.GE.TEND) GO TO 6070
 6055 READ(3) TT,(XCOEF(J),J=1,NOVAR),SWT2(1),SWT2(2)
 6060 READ(3) TT,(XCOEF(K),K=1,NOVAR),SWT2(1),SWT2(2)
C
C              GENERATE THE RELEVANT PRINTOUT TABLES FOR UP TO TEN
C              TIME POINTS.
C
 6070 WRITE(6,6910) SIDE(S),(TIME(K),K=1,10),((X(J,I),I=1,10),J=1,16)
      WRITE(6,6920) (X(17,I),I=1,10)
      K2=17
      DO 6080 J=1,3
      K1=K2+1
      K2=K1+10
 6080 WRITE(6,6930) J,((X(K,I),I=1,10),K=K1,K2)
      WRITE(6,6940) ((X(J,I),I=1,10),J=51,63)
      WRITE(6,6950) ((X(J,I),I=1,10),J=64,73)
      GO TO 2000
 6910 FORMAT(1H1//21X,9HSYSTEM:G2,5X,A10////5H TIME,26X,10(F8.1,2X)/
     1   1H ,13(10H**********)/
     2   7H TOTAL:,24X,10F10.3/
     3   8H  AT F1:,23X,10F10.3/
     4   8H  AT F2:,23X,10F10.3/
     5   8H  AT F3:,23X,10F10.3/
     6   7H  IN R:,24X,10F10.3//
     7   20H TOTAL LOST OR USED:,11X,10F10.3/
     8   8H  AT F1:,23X,10F10.3/
     9   8H  AT F2:,23X,10F10.3/
     *   8H  AT F3:,23X,10F10.3/
     1   7H  IN R:,24X,10F10.3//
     2   31H PORTION OF G2 TO BE REPLACED: ,10F10.3//
     3   10H RESUPPLY:,21X,10F10.3//
     4   20H MOVEMENT G2 R TO F:,11X,10F10.3/
     5   15X,6HTO F1:,10X,10F10.3/
     6   15X,6HTO F2:,10X,10F10.3/
     7   15X,6HTO F3:,10X,10F10.3/1H ,13(10H**********))
 6920 FORMAT(14H TOTAL LOSSES:,17X,10F10.3)
 6930 FORMAT( 7H   AT F,I1,1H:,22X,10F10.3/
     1   5X,10HDUE TO W1:,16X,10F10.3/
     *   12X,3HW2:,16X,10F10.3/
     *   12X,3HW3:,16X,10F10.3/
     *   12X,3HW4:,16X,10F10.3/
     2   12X,3HW5:,16X,10F10.3/
     3   12X,3HM1:,16X,10F10.3/
     4   12X,3HM2:,16X,10F10.3/
     5   12X,3HA1:,16X,10F10.3/
```

```
     6    12X,3HA2:,16X,10F10.3/
     7    12X,3HA3:,16X,10F10.3/)
 6940 FORMAT(8H   IN R:,23X,10F10.3/
     1    15H      DUE TO M1:,16X,10F10.3/
     2    12X,3HM2:,16X,10F10.3/
     3    12X,3HA1:,16X,10F10.3/
     4    12X,3HA2:,16X,10F10.3/
     5    12X,3HA3:,16X,10F10.3//
     6    31H TOTAL USED BY OR LOST WITH G1:,10F10.3/
     7    9H    AT F1:,22X,10F10.3/
     8    9H    AT F2:,22X,10F10.3/
     9    9H    AT F3:,22X,10F10.3/
     *    8H    IN R:,23X,10F10.3//
     1    21H NUMBER OF G2 PER G1:,10X,10F10.3/
     2    26H NUMBER OF G2 USED PER G1:,5X,10F10.3/1H ,13(10H**********))
 6950 FORMAT(14H DEMAND AT F1:,17X,10F10.3/
     1    11X,3HF2:,17X,10F10.3/
     2    11X,3HF3:,17X,10F10.3//
     3    27H MAX MOVEMENT OF G2 R TO F:,4X,10F10.3//
     4    21H MOVEMENT G2 R TO F1:,10X,10F10.3/
     5    18X,3HF2:,10X,10F10.3/
     6    18X,3HF3:,10X,10F10.3//
     7    26H MAXIMUM G2 DESIRED AT F1:,5X,10F10.3/
     8    23X,3HF2:,5X,10F10.3/
     9    23X,3HF3:,5X,10F10.3/1X,13(10H**********))
C
C      **************
C      *            *
C      * W/R TABLES *
C      *            *
C      **************
C
C              INITIALIZE LOCAL VARIABLES
C
 7000 DO 7020 I=1,10
      DO 7010 J=1,131
 7010 X(J,I)=0.0
 7020 TIME(I)=0.0
C
C              DO FOR UP TO TEN DATA SETS
C
      DO 7080 I=1,10
C
C              PUT IN "VDATA" THE INTEGRATED VALUES (VA) OR THE RATES
C              OF CHANGE (DVA) OF THE VARIABLES THEREIN, DEPENDING ON
C              WHETHER "SWTB" IS POSITIVE OR NEGATIVE RESPECTIVELY.
C
      IF(SWTB.GT.0) GO TO 7031
      DO 7030 IKJ=1,NCV
 7030 VDATA(IKJ)=DVA(IKJ)
      GO TO 7033
 7031 DO 7032 IKJ=1,NCV
 7032 VDATA(IKJ)=VA(IKJ)
 7033 CONTINUE
C
C              COMPUTE THE DESIRED DISPLAY VARIABLES FROM THE
C              APPROPRIATE DATA.
```

```
C
      TIME(I)=TT
      DO 7040 J=1,3
      K=3*(N-1)+J
      X(1+J,I)=V(NW+K,S)
      X(5+J,I)=V0602P(N,J,S)
      X(8+J,I)=D0603P(N,J,S)
 7040 X(13+J,I)=R0603P(N,J,S)
      X(5,I)=V(NWR+N,S)
      X(1,I)=X(2,I)+X(3,I)+X(4,I)+X(5,I)
      X(12,I)=R0604X(N,S)
      X(13,I)=X(14,I)+X(15,I)+X(16,I)
      X(17,I)=R0576P(N,S)
      DO 7050 J=1,3
      K=3*(N-1)+J
      L=(J-1)*11
      X(19+L,I)=A0502P(N,J,S)
      X(20+L,I)=A0404P(1,K,S)
      X(21+L,I)=A0404P(2,K,S)
      X(22+L,I)=A0404P(3,K,S)
      X(23+L,I)=A0404P(4,K,S)
      X(24+L,I)=A0404P(5,K,S)
      X(25+L,I)=A0309P(1,K,S)
      X(26+L,I)=A0309P(2,K,S)
      X(27+L,I)=A0329P(1,K,S)
      X(28+L,I)=A0329P(2,K,S)
 7050 X(29+L,I)=A0329P(3,K,S)
      X(52,I)=A0503P(N,S)
      X(53,I)=A0310P(1,S)
      X(54,I)=A0310P(2,S)
      X(55,I)=A0330P(1,S)
      X(56,I)=A0330P(2,S)
      X(57,I)=A0330P(3,S)
      X(59,I)=A0523P(N,1,S)
      X(60,I)=A0523P(N,2,S)
      X(61,I)=A0523P(N,3,S)
      X(62,I)=A0534P(N,S)
      X(58,I)=X(59,I)+X(60,I)+X(61,I)+X(62,I)
      X(18,I)=X(19,I)+X(30,I)+X(41,I)+X(52,I)+X(58,I)
      DO 7060 J=1,3
      X(63+J,I)=V(NR+J+3*(N-1),S)
      X(72+J,I)=V0603P(N,J,S)
      X(75+J,I)=D0604P(N,J,S)
      X(80+J,I)=R0604P(N,J,S)
      X(84+J,I)=V0546P(N,J,S)
      X(88+J,I)=V0548P(N,J,S)
      L=3*(J-1)
      X(95+L,I)=A0571P(N,J,S)
      X(96+L,I)=A0551P(N,J,S)
      X(94+L,I)=A0571P(N,J,S)+A0551P(N,J,S)
      L=(J-1)*8
      X(109+L,I)=R0402P(N,J,S)
      X(110+L,I)=R0403P(N,J,S)
      X(111+L,I)=R0404P(N,J,S)
      X(112+L,I)=R0404P(N,3+J,S)
      X(113+L,I)=R0404P(N,6+J,S)
      X(114+L,I)=R0404P(N,9+J,S)
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      X(115+L,I)=R0404P(N,12+J,S)
      X(108+L,I)=X(109+L,I)+X(110+L,I)+X(111+L,I)+X(112+L,I)+X(113+L,I)+
     1   X(114+L,I)+X(115+L,I)
 7060 X(68+J,I)=X(94+3*(J-1),I)+X(108+L,I)
      X(67,I)=V(NRR+N,S)
      X(63,I)=X(64,I)+X(65,I)+X(66,I)+X(67,I)
      X(84,I)=R0577P(N,S)
      X(79,I)=R0605X(N,S)
      X(80,I)=X(81,I)+X(82,I)+X(83,I)
      X(88,I)=V0547P(N,S)
      X(92,I)=V0549P(N,S)
      X(132,I)=V0550P(N,S)
      X(104,I)=A0572P(N,S)
      X(105,I)=A0561P(N,S)
      X(106,I)=A0573P(N,S)
      X(103,I)=X(104,I)+X(105,I)+X(106,I)
      X(93,I)=X(94,I)+X(100,I)+X(97,I)+X(103,I)
      X(107,I)=X(108,I)+X(116,I)+X(124,I)
      X(72,I)=X(103,I)
      X(68,I)=X(69,I)+X(70,I)+X(71,I)+X(72,I)
C
C              READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT
C              TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE"
C              PARAMETER.  (NOTE:  NEW VALUES IN "VA" AND "DVA")
C
      IF(TT.GE.TEND) GO TO 7090
      IF(SWTA.NE.1.0) GO TO 7080
      DO 7070 IKJ=1,INTV
      IF(TT.GE.TEND) GO TO 7090
 7070 READ(3) TT,(XCOEF(K),K=1,NOVAR),SWT2(1),SWT2(2)
 7080 READ(3) TT,(XCOEF(K),K=1,NOVAR),SWT2(1),SWT2(2)
C
C              GENERATE THE RELEVANT PRINTOUT TABLES FOR UP TO TEN
C              TIME POINTS.
C
 7090 WRITE(6,7910) N,N,SIDE(S),(TIME(I),I=1,10),N,((X(I,J),J=1,10),
     1   I=1,18)
      K2=18
      DO 7095 K=1,3
      K1=K2+1
      K2=K1+10
 7095 WRITE(6,7920) K,((X(I,J),J=1,10),I=K1,K2)
      WRITE(6,7930) ((X(I,J),J=1,10),I=52,62)
      WRITE(6,7940) N,((X(I,J),J=1,10),I=63,84)
      WRITE(6,7950) ((X(I,J),J=1,10),I=85,92),(X(132,J),J=1,10)
      WRITE(6,7960) ((X(I,J),J=1,10),I=93,106)
      WRITE(6,7970) ((X(I,J),J=1,10),I=107,131)
      GO TO 2000
 7910 FORMAT(1H1//21X,8HSYSTEM:W,I1,6H AND R,I1,5X,A10///5H TIME,26X,
     1   10(F8.1,2X)/1X,13(10H**********)/8H TOTAL W,I1,1H:,21X,10F10.3/
     2   4X,6HAT F1:,21X,10F10.3/4X,6HAT F2:,21X,10F10.3/
     3   4X,6HAT F3:,21X,10F10.3/5X,5HIN R:,21X,10F10.3//
     4   19H MAX DESIRED AT F1:,12X,10F10.3/13X,6HAT F2:,12X,10F10.3/
     5   13X,6HAT F3:,12X,10F10.3//
     6   14H DEMAND AT F1:,17X,10F10.3/8X,6HAT F2:,17X,10F10.3/
     7   8X,6HAT F3:,17X,10F10.3//
     8   26H MAX MOVEMENT OF W,R TO F:,5X,10F10.3//
```

```
     9    22H MOVEMENT OF W,R TO F:,9X,10F10.3//16X,6HTO F1:,9X,10F10.3/
     *    16X,6HTO F2:,9X,10F10.3/16X,6HTO F3:,9X,10F10.3//
     1    10H RESUPPLY:,21X,10F10.3/1X,13(10H**********)/
     2    14H TOTAL LOSSES:,17X,10F10.3/)
7920 FORMAT(8X,4HAT F,I1,1H:,17X,10F10.3/
     1    4X,10HDUE TO W1:,17X,10F10.3/
     2    11X,3HW2:,17X,10F10.3/
     3    11X,3HW3:,17X,10F10.3/
     4    11X,3HW4:,17X,10F10.3/
     5    11X,3HW5:,17X,10F10.3/
     6    11X,3HL1:,17X,10F10.3/
     7    11X,3HL2:,17X,10F10.3/
     8    11X,3HA1:,17X,10F10.3/
     9    11X,3HA2:,17X,10F10.3/
     *    11X,3HA3:,17X,10F10.3/)
7930 FORMAT(9X,5HIN R:,17X,10F10.3/
     1    11X,3HL1:,17X,10F10.3/
     2    11X,3HL2:,17X,10F10.3/
     3    11X,3HA1:,17X,10F10.3/
     4    11X,3HA2:,17X,10F10.3/
     5    11X,3HA3:,17X,10F10.3//
     6    14H LOST WITH G1:,17X,10F10.3/
     7    8X,6HAT F1:,17X,10F10.3/
     8    8X,6HAT F2:,17X,10F10.3/
     9    8X,6HAT F3:,17X,10F10.3/
     *    9X,5HIN R:,17X,10F10.3,2(/1X,13(10H**********)))
7940 FORMAT(8H TOTAL R,I1,1H:,21X,10F10.3/
     1    4X,6HAT F1:,21X,10F10.3/4X,6HAT F2:,21X,10F10.3/
     2    4X,6HAT F3:,21X,10F10.3/5X,5HIN R:,21X,10F10.3//
     3    20H TOTAL LOST OR USED:,11X,10F10.3/14X,6HAT F1:,11X,10F10.3/
     4    14X,6HAT F2:,11X,10F10.3/14X,6HAT F3:,11X,10F10.3/
     5    15X,5HIN R:11X,10F10.3//19H MAX DESIRED AT F1:,12X,10F10.3/
     6    13X,6HAT F2:,12X,10F10.3/13X,6HAT F3:,12X,10F10.3//
     7    14H DEMAND AT F1:,17X,10F10.3/8X,6HAT F2:,17X,10F10.3/
     8    8X,6HAT F3:,17X,10F10.3//26H MAX MOVEMENT OF R,R TO F:,5X,
     9    10F10.3//22H MOVEMENT OF R,R TO F:,9X,10F10.3/
     *    16X,6HTO F1:,9X,10F10.3/16X,6HTO F2:,9X,10F10.3/
     1    16X,6HTO F3:,9X,10F10.3//10H RESUPPLY:,21X,10F10.3/
     2    1X,13(10H**********))
7950 FORMAT(22H NUMBER R PER W AT F1:,9X,10F10.3/16X,6HAT F2:,9X
     1    10F10.3/16X,6HAT F3:,9X,10F10.3/
     2    17X,5HIN R:,9X,10F10.3//31H NUMBER OF R IN TRANSIT AT F1: ,
     3    10F10.3/24X,7HAT F2: ,10F10.3/24X,7HAT F3: ,10F10.3/
     4    25X,6HIN R: ,10F10.3//22H NUMBER OF R IN SITES:,9X,10F10.3/
     5    1X,13(10H**********))
7960 FORMAT(14H TOTAL LOSSES:,17X,10F10.3//8X,6HAT F1:,17X,10F10.3/
     1    7X,7HWITH W:,17X,10F10.3/6X,8HWITH G2:,17X,10F10.3//
     2    8X,6HAT F2:,17X,10F10.3/7X,7HWITH W:,17X,10F10.3/
     3    6X,8HWITH G2:,17X,10F10.3//8X,6HAT F3:,17X,10F10.3/
     4    7X,7HWITH W:,17X,10F10.3/6X,8HWITH G2:,17X,10F10.3//
     5    9X,5HIN R:,17X,10F10.3/7X,7HWITH W:,17X,10F10.3/
     6    6X,8HWITH G2:,17X,10F10.3/7X,7HWITH S:,17X,10F10.3/
     7    1X,13(10H**********))
7970 FORMAT(12H TOTAL USED:,19X,10F10.3/6X,6HAT F1:,19X,10F10.3/
     1    12H AGAINST G1:,19X,10F10.3/9X,3HG2:,19X,10F10.3/
     2    9X,3HW1:,19X,10F10.3/9X,3HW2:,19X,10F10.3/9X,3HW3:,19X,10F10.3/
     3    9X,3HW3:,19X,10F10.3/9X,3HW5:,19X,10F10.3//
```

```
     4    6X,6HAT F2:,19X,10F10.3/12H AGAINST G1:,19X,10F10.3/
     5    9X,3HG2:,19X,10F10.3/9X,3HW1:,19X,10F10.3/9X,3HW2:,19X,10F10.3/
     6    9X,3HW3:,19X,10F10.3/9X,3HW4:,19X,10F10.3/9X,3HW5:,19X,10F10.3/
     7    /6X,6HAT F3:,19X,10F10.3/12H AGAINST G1:,19X,10F10.3/
     8    9X,3HG2:,19X,10F10.3/9X,3HW1:,19X,10F10.3/9X,3HW2:,19X,10F10.3/
     9    9X,3HW3:,19X,10F10.3/9X,3HW4:,19X,10F10.3/9X,3HW5:,19X,10F10.3/
     *    1X,13(10H**********))
C
C     ******************
C     *                *
C     * R FACTOR TABLE *
C     *                *
C     ******************
C
C             INITIALIZE LOCAL VARIABLES
C
 8000 DO 8020 I=1,10
      DO 8010 J=1,32
 8010 X(J,I)=0.0
 8020 TIME(I)=0.0
C
C             DO FOR UP TO TEN DATA SETS
C
      DO 8050 I=1,10
      DO 8030 IKJ=1,NCV
 8030 VDATA(IKJ)=DVA(IKJ)
C
C             COMPUTE THE DESIRED DISPLAY VARIABLES FROM THE
C             APPROPRIATE DATA.
C
      TIME(I)=TT
      X(2,I)=A0401P(N,S)
      X(3,I)=A0402P(1,N,S)
      X(4,I)=A0402P(2,N,S)
      X(5,I)=A0402P(3,N,S)
      X(6,I)=A0402P(4,N,S)
      X(7,I)=A0402P(5,N,S)
      X(8,I)=A0321P(1,N,S)
      X(9,I)=A0321P(2,N,S)
      X(10,I)=A0321P(3,N,S)
      X(11,I)=A0301P(1,N,S)
      X(12,I)=A0301P(2,N,S)
      SS=3-S
      X(13,I)=V(NG1F+N,SS)
      DO 8035 K=2,12
 8035 X(1,I)=X(1,I)+X(K,I)
      X(14,I)=X(13,I)*X(1,I)
      X(16,I)=A0401P(N,SS)
      X(17,I)=A0402P(1,N,SS)
      X(18,I)=A0402P(2,N,SS)
      X(19,I)=A0402P(3,N,SS)
      X(20,I)=A0402P(4,N,SS)
      X(21,I)=A0402P(5,N,SS)
      X(22,I)=A0321P(1,N,SS)
      X(23,I)=A0321P(2,N,SS)
      X(24,I)=A0321P(3,N,SS)
      X(25,I)=A0301P(1,N,SS)
```

```
      X(26,I)=A0301P(2,N,SS)
      X(27,I)=V(NG1F+N,S)
      DO 8036 K=16,26
 8036 X(15,I)=X(15,I)+X(K,I)
      X(28,I)=X(15,I)*X(27,I)
      X(29,I)=X(28,I)-X(14,I)
      X(30,I)=X(28,I)+X(14,I)
      X(31,I)=DIVIDE(X(29,I),X(30,I))
      X(32,I)=C0601P(N,S)
C
C             READ FROM TAPE3 A NEW DATA SET CORRESPONDING TO THE NEXT
C             TIME POINT, WHICH IS INDICATED BY THE CURRENT "CARD TYPE"
C             PARAMETER.  (NOTE:  NEW VALUES IN "VA" AND "DVA")
C
      IF(TT.GE.TEND) GO TO 8060
      IF(SWTA.NE.1.0) GO TO 8050
      DO 8040 IKJ=1,INTV
      IF(TT.GE.TEND) GO TO 8060
 8040 READ(3) TT,(XCOEF(J),J=1,NOVAR),SWT2(1),SWT2(2)
 8050 READ(3) TT,(XCOEF(J),J=1,NOVAR),SWT2(1),SWT2(2)
C
C             GENERATE THE RELEVANT PRINTOUT TABLES FOR UP TO TEN
C             TIME POINTS.
C
 8060 WRITE(6,8910) N,SIDE(S),(TIME(K),K=1,10),((X(I,J),J=1,10),I=1,14)
      WRITE(6,8920) ((X(I,J),J=1,10),I=15,32)
      GO TO 2000
 8910 FORMAT(1H1//21X,17HR FACTOR AT FRONT,I1,5X,A10////5H TIME,26X,
     1    10(F8.1,2X)/1H ,13(10H**********)/
     2    15H TOTAL G1 LOSS:,16X,10F10.3/
     3    16H LOSS DUE TO G1:,15X,10F10.3/
     4    13X,3HW1:,15X,10F10.3/
     5    13X,3HW2:,15X,10F10.3/
     *    13X,3HW3:,15X,10F10.3/
     *    13X,3HW4:,15X,10F10.3/
     *    13X,3HW5:,15X,10F10.3/
     6    13X,3HA1:,15X,10F10.3/
     7    13X,3HA2:,15X,10F10.3/
     8    13X,3HA3:,15X,10F10.3/
     9    13X,3HL1:,15X,10F10.3/
     *    13X,3HL2:,15X,10F10.3//
     1    11H TOTAL +G1:,20X,10F10.3//
     2    24H TOTAL LOSS * TOTAL +G1:,7X,10F10.3///)
 8920 FORMAT(16H TOTAL +G1 LOSS:,15X,10F10.3/
     1    16H LOSS DUE TO G1:,15X,10F10.3/
     2    13X,3HW1:,15X,10F10.3/
     3    13X,3HW2:,15X,10F10.3/
     *    13X,3HW3:,15X,10F10.3/
     *    13X,3HW4:,15X,10F10.3/
     *    13X,3HW5:,15X,10F10.3/
     4    13X,3HA1:,15X,10F10.3/
     5    13X,3HA2:,15X,10F10.3/
     6    13X,3HA3:,15X,10F10.3/
     7    13X,3HL1:,15X,10F10.3/
     8    13X,3HL2:,15X,10F10.3//
     9    10H TOTAL G1:,21X,10F10.3//
     *    24H TOTAL +LOSS * TOTAL G1:,7X,10F10.3///
```

```
     1    20H PRODUCT DIFFERENCE:,11X,10F10.3/
     2    13H PRODUCT SUM:,18X,10F10.3/
     3    18H DIFFERENCE / SUM:,13X,10F10.3//
     4    10H R FACTOR:,21X,10F10.3/1X,13(10H**********))
      END
```

```
      PROGRAM GRAPHC2(INPUT,OUTPUT,TAPE5=INPUT,TAPE4=OUTPUT,TAPE3,TAPE6)
C
C    PLOTTER DRIVER ROUTINE - RETRIVES AND BUILDS THE PLOT
C           IDENTIFICATION HEADERS AND RUN DESCRIPTIONS -
C           LOCATES THE DESIRED START POINT ON THE HISTORY TAPE -
C           THEN CALLS THE APPROPRIATE SUBROUTINES TO PLOT THE
C           GRAPHS.
C
      COMMON /BUFFS/ A(8),B(8)
      COMMON /PNTR/IOP(1000),LABEL(7,100),SYMBOL(14),IDVPNT(2000),SP,
     1IVPNT(3240),Z(6480)
      COMMON /TLIMIT/ TMIN,TMAX,DATE ,DTINER
      COMMON /PDVV/ DV(3240),V(3240),TITLEO(6)
      COMMON /DVV/NV,NDV
      DIMENSION SWT2(2),XCOEF(1685)
      COMMON /TOCA/ CNTNTS(100,17),ENABLE
      COMMON /TOCB/ INDEX,INX2
      DIMENSION X(135),Y(135)
      DIMENSION P(20)
      DIMENSION Q(10),IQ(10)
      DIMENSION TIMER(300)
      LOGICAL LAST
      DIMENSION TITS(3)
      DIMENSION RUNER(2)
      DATA RUNER/10HRUN INFORM,10HATION      /
      DATA  NV/3236/,NDV/1950/,NXC/1682/
      DATA LAST /.FALSE./
      DATA NPP/50/
      DATA TITS/10HRUN DESCRI,10HPTION:     ,10H           /
      DATA SYMBOL /1HA,1HB,1HC,1HD,1HE,1HF,1HG,1HH,1HI,1HJ,1HL,1HM,1HN,1
     1HO/
      DATA P/20*1H /
      I = 0
      INDEX=0
      INX2=0
      ENABLE=0
      REWIND 3
      WRITE(4,430)
      READ(3) AMODEL
      IF(AMODEL.EQ.9HARTILLERY) GOTO 1000
      IF(AMODEL.EQ.3HAIR) GOTO  900
      WRITE(4,350)
      STOP
  900 CONTINUE
      NV = 1252
      NDV = 798
      NXC = 780
      I=0
 1000 I=I+1
      READ(3) (CNTNTS(I,K),K=1,8)
      IF(CNTNTS(I,1).NE.3HEND) GO TO 1000
      READ(3) TITLEO,DATEO,TINC,DELT,ERROR,DTINER,DTOUTR,TSTART,TEND,ALPHA
      ICNT = I + 2
      CALL XDATE(DATE)
      NL = 0
      CALL LCHPTR(TITLEO,DUM,1,DATE,-20,60)
      ENCODE (20,100,P) TINC
```

```
      CALL LCHPTR(P,RUNER,15,DATE,NL,55)
      ENCODE (20,101,P) DELT
      CALL LCHPTR(P,RUNER,15,DATE,NL,55)
      ENCODE (20,102,P) ERROR
      CALL LCHPTR(P,RUNER,15,DATE,NL,55)
      IF(AMODEL.EQ.3HAIR) GOTO 1010
      READ(3) TIME,(XCOEF(I),I=1,NXC),(V(I),I=1,NV),(DV(I),I=1,NDV),
     1   SWT2(1),SWT2(2)
      GOTO 1015
 1010 CONTINUE
      READ(3) TIME,(XCOEF(I),I=1,NXC),(V(I),I=1,NV),(DV(I),I=1,NDV)
 1015 CONTINUE
      ENCODE (20,103,P) DTINER
      CALL LCHPTR(P,RUNER,15,DATE,NL,55)
      ENCODE (20,104,P) DTOUTR
      CALL LCHPTR(P,RUNER,15,DATE,NL,55)
      ENCODE (20,105,P) TEND
      CALL LCHPTR(P,RUNER,15,DATE,NL,55)
      ENCODE (20,106,P) DATEO
      CALL LCHPTR(P,RUNER,15,DATE,NL,55)
      TMIN = TSTART
      TMAX = TEND
      I=0
 1020 NL=0
      NTIMES=1
      CALL LCHPTR(TIT5,RUNER,30,DATE,NL,-55)
 1030 NTIMES=NTIMES+1
      I=I+1
      IF(CNTNTS(I,1).EQ.3HEND) GO TO 1040
      WRITE(4,400) (CNTNTS(I,K),K=1,8)
      IF(NTIMES.GE.25) GO TO 1020
      GO TO 1030
 1040 CONTINUE
      READ (5,109) A
      IF(A(1).NE.6HTLIMIT) GO TO 2000
      DECODE(20,107,A(2)) TMIN,TMAX
C
C             WHEN THE TIME LIMITS ON THE CONTROL CARD ARE OUTSIDE THE
C             TIME LIMITS ON TAPE3, GIVE A WARNING MSG AND REORDER THE
C             IMPROPER TIMES (TMIN AND/OR TMAX) ACCORDING TO THE TIME
C             RANGE OF THE "COMBAT II" RUN (TAPE3).
C
      IF(TMAX.GT.TEND.OR.TMAX.LE.TSTART) GOTO 2010
      GOTO 2015
 2010 WRITE(4,410) TMAX,TEND
      TMAX = TEND
 2015 IF(TMIN.GE.TEND.OR.TMIN.LT.TSTART) GOTO 2020
      GOTO 2025
 2020 WRITE(4,420) TMIN,TSTART
      TMIN = TSTART
 2025 CONTINUE
C
      READ (5,109) A
 2000 CONTINUE
      READ (5,109) B
      ENCODE(20,111,P) TMIN
      CALL LCHPTR(P,RUNER,15,DATE,NL,55)
```

```
      ENCODE(20,110,P)TMAX
      CALL LCHPTR(P,RUNER,15,DATE,NL,55)
      CALL LCHPTR(TITLEO,DUM,1,DATE,-80,60)
      INDEX=INDEX+1
      DO 2050 I=1,8
      CNTNTS(INDEX,I)=A(I)
 2050 CNTNTS(INDEX,I+9)=B(I)
      SWT = 1
 2100 CONTINUE
      IF(LAST) GO TO 3700
      DO 2105 K=1,1000
      IOP(K)=0
      IDVPNT(K)=IDVPNT(K+1000)=0
      IVPNT(K)=IVPNT(K+1000)=0
 2105 Z(K)=Z(K+1000)=Z(K+2000)=Z(K+3000)=Z(K+4000)=0
      CALL INPUTR (LAST)
      NPLOT = 0
      N = 0
      REWIND 3
      DO 2150 I=1,ICNT
      READ (3) DUM
 2150 CONTINUE
 2200 CONTINUE
      IF(AMODEL.EQ.3HAIR) GOTO 2210
      READ(3) TIME,(XCOEF(I),I=1,NXC),(V(I),I=1,NV),(DV(I),I=1,NDV),
     1   SWT2(1),SWT2(2)
      GOTO 2215
 2210 CONTINUE
      READ(3) TIME,(XCOEF(I),I=1,NXC),(V(I),I=1,NV),(DV(I),I=1,NDV)
 2215 CONTINUE
      IF(EOF(3))2400,2300
 2300 CONTINUE
      IF(TIME.LT.TMIN) GOTO 2200
      IF(SWT.EQ.1) TMIN = TIME
      SWT = 0
      N = N+1
      TIMER(N) = TIME
      CALL SETUPR(N)
      IF (TIME.LT.TMAX) GO TO 2200
 2400 CONTINUE
      CALL BREAD(NP,-1)
      IF (NP.EQ.0) GO TO 2100
      NPLOT = NPLOT+1
      YMIN = 1.E200
      YMAX = -1.E200
      DO 2800 I=1,NP
      CALL BREAD(L,1)
      IF (Z(L-2).LT.YMIN) YMIN = Z(L-2)
      IF (Z(L-1).GT.YMAX) YMAX = Z(L-1)
 2800 CONTINUE
      IF((YMAX-YMIN).LT.1.0) YMAX=YMIN+1
      CALL PLOTR(TMIN,TMAX,YMIN,YMAX,X,Y,NPP,LABEL(1,NPLOT),DATE,
      CALL BREAD(L,0)
      DO 3000 I=1,NP
      CALL BREAD (L,1)
      CALL SETUP(TMIN,TMAX,YMIN,YMAX,N,Z(L),X,Y,NPP)
      CALL PLOTR(TMIN,TMAX,YMIN,YMAX,X,Y,NPP,LABEL(1,NPLOT),DATE,
```

AD-A052 025 BDM CORP MCLEAN VA F/G 15/7
COMBAT-II USER'S GUIDE.(U)
JUN 77 B P AYRES, S BRADY, F L KLOTZ DNA001-76-C-0067
UNCLASSIFIED BDM/W-77-310-TR DNA-4346F NL

4 OF 4
AD A052 025

END
DATE FILMED
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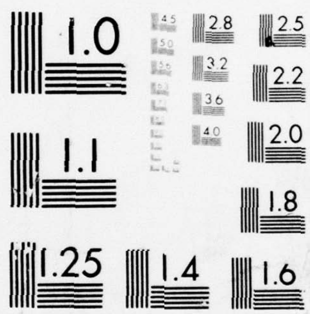

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

```
3000 CONTINUE
     CALL PLOTR(TMIN,TMAX,YMIN,YMAX,X,Y,NPP,LABEL(1,NPLOT),DATE,+1)
     CALL BREAD(L,0)
     CALL TITLES(A,0)
     NL = 0
     NPQ = NP+1
     CALL LCHPTR(TITLEO,DUM,1,DATE,-130,60)
     DO 3200 J=1,9
     CALL BREAD(L,1)
     CALL TITLES(A,1)
     Q(J)=A(1)
     IQ(J) = L
3200 CONTINUE
     ENCODE (130,300,P)Q
     CALL LCHPTR(P,LABEL(1,NPLOT),70,DATE,NL,55)
     DO 3500 J=1,N
     Q(1) = TIMER(J)
     DO 3400 K=2,10
     L = IQ(K-1)
     Q(K) = Z(L+J-1)
3400 CONTINUE
     CALL LCHPTR(P,LABEL(1,NPLOT),70,DATE,NL,-55)
     WRITE (6,302) (Q(K),K=1,NPQ)
3500 CONTINUE
     GO TO 2400
3700 WRITE(4,98)
     DO 3800 K=1,INDEX
3800 WRITE(4,99) (CNTNTS(K,J),J=1,17)
     STOP1
  98 FORMAT(1H1/21X,*TABLE OF CONTENTS*///)
  99 FORMAT(6X,8A10,5X,4HPAGE,F8.0/21X,8A10/)
 100 FORMAT(*TINC      =*F10.6)
 101 FORMAT(*DELT      =*F10.6)
 102 FORMAT(*ERROR     =*F10.6)
 103 FORMAT(*DTINNER   =*F10.6)
 104 FORMAT(10HDTOUTR    =,F10.6)
 105 FORMAT(10HTEND      =,F10.6)
 106 FORMAT(10HRUN DATED=,A10)
 107 FORMAT(2F10.6)
 109 FORMAT(8A10)
 110 FORMAT(*TMAX      =*F10.6)
 111 FORMAT(*TMIN      =*F10.6)
 300 FORMAT(*          TIME*,9(3XA10))
 302 FORMAT(F13.2,9(E13.6))
 350 FORMAT(////* UNRECOGNIZED MODEL TYPE- INCORRECT TAPE3*///)
 400 FORMAT(1X/21X,8A10)
 410 FORMAT(///* WARNING!...MAX TIME ERROR CORRECTED*,5X,
    1 *CONTROL CARD MAX TIME:*,F10.2/41X,
    2 *TAPE3 MAX TIME:*,7X,F10.2///)
 420 FORMAT(///* WARNING!...MIN TIME ERROR CORRECTED*,5X,
    1 *CONTROL CARD MIN TIME:*,F10.2/41X,
    2 *TAPE3 MIN TIME:*,7X,F10.2///)
 430 FORMAT(1H1)
     END
```

```
      SUBROUTINE PLOTR  (XMIN,XMAX,YMIN,YMAX,X,Y,N,LABEL,DATE,M)
C
C        CALCULATES THE SCALING OF THE GRAPH AND PERFORMS THE
C        ACTUAL PLOTTING OF THE POINTS
C
      COMMON /TOCA/ CNTNTS(100,17),ENABLE
      COMMON /TOCB/ INDEX,INX2
      COMMON /PNTR/IDP(1000),SABEL(7,100),SYMBOL(14),IDVPNT(2000),SP,
     1IVPNT(3240),Z(6480)
      DIMENSION X(1),Y(1),LABEL(1),PLOT(101,51),XS(6)
      DIMENSION S(5151)
      DIMENSION DUMMY (20)
      EQUIVALENCE (S,PLOT)
      DATA PLOT/5151*1H /
      DATA DUMMY /20*1H /
      IF (M) 2000,3000,4000
 2000 CONTINUE
      NP = 1
      XSCALE=100./(XMAX-XMIN)
      YDIF=100
      IF (YMAX.NE.YMIN) YDIF=YMAX-YMIN
      YSCALE=50./YDIF
      IF(0.0.GT.XMAX.OR.0.0.LT.XMIN) GO TO 2300
      IO = 1.5-XMIN*XSCALE
      DO 2200 J=1,51
      PLOT(IO,J) = 1HI
 2200 CONTINUE
 2300 CONTINUE
      IF(0.0.GT.YMAX.OR.0.0.LT.YMIN) RETURN
      JO = 1.5-YMIN*YSCALE
      DO 2600 I=1,101
      PLOT(I,JO) = 1H-
 2600 CONTINUE
      RETURN
 3000 CONTINUE
      SYM = SYMBOL(NP)
      DO 3200 I =1,N
      XP = X(I)
      YP = Y(I)
      IF (XMIN.GT.XP.OR.XMAX.LT.XP.OR.YMIN.GT.YP.OR.YMAX.LT.YP) GO TO
     1 3200
      IP = 1.5+(XP-XMIN)*XSCALE
      JP = 1.5+(YP-YMIN)*YSCALE
      PLOT(IP,JP) = SYM
 3200 CONTINUE
      NP = NP+1
      RETURN
 4000 CONTINUE
      NL = 0
      ENABLE=1
      INX2=INX2+1
      CALL LCHPTR (DUMMY,LABEL,70,DATE,NL,55)
      ENABLE=0
      WRITE (6,100)
      DY=(YMAX-YMIN)*.2
      YO = YMAX
      CALL TITLES (A,0)
```

```
      DO 4400 I=1,51,10
      K=52-I
      CALL TITLES(A,I)
      WRITE (6,101)A,YO,(PLOT(J,K),J=1,101)
      IF(I.EQ.51) GO TO 4400
      K1 = I+1
      K2=I+9
      DO 4200 KX=K1,K2
      L=52-KX
      CALL TITLES(A,1)
      WRITE (6,102) A,(PLOT(J,L),J=1,101)
 4200 CONTINUE
      YO = YO-DY
 4400 CONTINUE
      WRITE (6,103)
      DX = (XMAX-XMIN)*.2
      XO = XMIN
      DO 4600 I=1,6
      XS (I) = XO
      XO = XO+DX
 4600 CONTINUE
      WRITE (6,104) XS
      DO 4800 I=1,5151
      S(I) = 1H
 4800 CONTINUE
      RETURN
  100 FORMAT(25X,51(2H**),1H*)
  101 FORMAT(1X,A10,1X,E13.6,1H*,101A1,1H*)
  102 FORMAT(1X,A10,14X,1H*,101A1,1H*)
  103 FORMAT(25X,2H*I,5(20H*******************I))
  104 FORMAT(9X,6E20.6)
      END
```

```
      SUBROUTINE SETUPR(N)
C
C     CALCULATES THE POSITION OF THE CURVE POINTS AND
C     TRANSFORMS THE DATA PRIOR TO CURVE SMOOTHING
C
      COMMON /PDVV/ DV(3240),V(3240),TITLEO(6)
      COMMON /PNTR/IOP(1000),LABEL(7,100),SYMBOL(14),IDVPNT(2000),SP,
     1IVPNT(3240),Z(6480)
      COMMON /DVV/NV,NDV
      DO 2200 I=1,NV
      M = IVPNT(I)
      IF(M.EQ.0) GO TO 2200
      Z(M+N-1) = V(I)
      IF (V(I).LT.Z(M-2)) Z(M-2) = V(I)
      IF (V(I).GT.Z(M-1)) Z(M-1) = V(I)
 2200 CONTINUE
      DO 2400 J=1,NDV
      M=IDVPNT(J)
      IF (M.EQ.0) GO TO 2400
      Z(M+N-1) = DV(J)
      IF (DV(J).LT.Z(M-2)) Z(M-2) = DV(J)
      IF (DV(J).GT.Z(M-1)) Z(M-1) = DV(J)
 2400 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE BREAD(IALPH,M)
C
C     BUILDS THE LABELS FOR THE GRAPHS
C     AND THE SCALES FOR THE AXISES
C
      COMMON /PNTR/IOP(1000),LABEL(7,100),SYMBOL(14),IDVPNT(2000),SP,
     1IVPNT(3240),Z(6480)
      DATA I /1/
      IF (M) 2000,2600,2200
 2000 CONTINUE
      IALPH=IABS(IOP(I))
      N = IALPH
      IO = I
      J = 1
      K = 1
      I = I+N+1
      IF (N.EQ.0) I = 1
      RETURN
 2200 CONTINUE
      IF (J.GT.N) RETURN
      L = IOP(J+IO)
      IF(L.LT.0) GO TO 2400
      IALPH = IVPNT(L)
      J = J+1
      RETURN
 2400 IALPH=IDVPNT(-L)
      J=J+1
      RETURN
 2600 CONTINUE
      J = 1
      RETURN
      ENTRY TITLES
      IALPH = 14
      IF (M) 2000,3400,3000
 3000 CONTINUE
      IF (K.GT.N) RETURN
      L = IOP(K+IO)
      IF (L.LT.0) GO TO 3200
      ENCODE (10,101,IALPH) L,SYMBOL(K)
      K = K+1
      RETURN
 3200 CONTINUE
      L = -L
      ENCODE (10,100,IALPH) L,SYMBOL(K)
      K = K+1
      RETURN
 3400 CONTINUE
      K = 1
      RETURN
  100 FORMAT(*DV(*I4*) *A1)
  101 FORMAT(* V(*I4*) *A1)
      END
```

```
      SUBROUTINE SETUP (TMIN,TMAX,VMIN,VMAX,N,V,X,Y,NP)
C
C     PERFORMS THE ACTUAL CURVE SMOOTHING AND SCALING OF THE DATA
C
      DIMENSION V(1),X(1),Y(1)
      DATA NT/100/, NV/50/
      SCT=NT/(TMAX-TMIN)
      SCV=NV/(VMAX-VMIN)
      SCT2 = SCT*SCT
      SCV2 = SCV*SCV
      DT = (TMAX-TMIN)/(N-1)
      DT2 = DT*DT
      DT2SCT = DT2*SCT2
      NN = N-1
      S2 = 0.0
      DO 2000 I= 1,NN
      S2 = SQRT((V(I+1)-V(I))**2*SCV2+DT2SCT)+S2
 2000 CONTINUE
      DS=S2/(NP-1)
      T0 = TMIN
      DS0 = DS
      Y(1) = V(1)
      X(1) = T0
      K = 2
      I = 2
 2100 CONTINUE
      T1 = T0+DT
      DS1 = SQRT((V(I)-V(I-1))**2*SCV2+DT2SCT)
 2200 IF (DS0.GT.DS1) GO TO 2400
      FRACT = DS0/DS1
      X(K) = T0+FRACT*DT
      Y(K) = V(I-1)+FRACT*(V(I)-V(I-1))
      K = K+1
      DS0 = DS0+DS
      IF (K.GT.NP) RETURN
      GO TO 2200
 2400 CONTINUE
      DS0 = DS0-DS1
      I = I+1
      T0 = T1
      GO TO 2100
      END
```

```
      SUBROUTINE INPUTR(LEOF)
C
C     BRINGS IN THE CONTROL CARDS AND CLEARS THE  BUFFERS AND
C     WORKING VARIABLES PRIOR TO SETUP FOR THE NEXT GRAPH
C
      COMMON /DVV/NV,NDV
      COMMON /TLIMIT/ TMIN,TMAX,DATE ,DT
      COMMON /BUFFS/ A(8),B(8)
      COMMON /TOCA/ CNTNTS(100,17),ENABLE
      COMMON /TOCB/ INDEX,INX2
      DIMENSION JOP(14)
      COMMON /PNTR/IOP(1000),LABEL(7,100),SYMBOL(14),IDVPNT(2000),SP,
     1IVPNT(3240),Z(6480)
      REAL LABEL
      LOGICAL LEOF
      LOGICAL LBUFF
      DATA LBUFF /.FALSE./
      IPNT = 3
      KOP = 1
      KC = 0
      N = (TMAX-TMIN)/DT+1.5
      DO 2000 I=1,NV
      IVPNT(I) = 0
      IDVPNT(I) = 0.
 2000 CONTINUE
      GO TO  2600
 2200 CONTINUE
      READ (5,100) A,B
      IF(EOF(5)) 2400,2500
 2400 CONTINUE
      LEOF = .TRUE.
      RETURN
 2500 INDEX=INDEX+1
      DO 2300 K=1,8
      CNTNTS(INDEX,K)=A(K)
 2300 CNTNTS(INDEX,K+9)=B(K)
 2600 CONTINUE
      DECODE(70,101,B(2)) JOP
      DO 2650 K=1,14
      IF(JOP(K).EQ.0) GO TO 2660
 2650 CONTINUE
      K=14
 2660 IF((IPNT+K*(N+2)).GT.5000) RETURN
      KOPO = KOP
      DO 3000 K= 1,14
      L = JOP(K)
      IF (L.EQ.0) GO TO 3000
      KOP = KOP+1
      IF (KOP.GT.1000) RETURN
      IOP(KOP) = L
      IF(L.LT.0) GO TO 2700
      M = IVPNT(L)
      IF (M.NE.0) GO TO 3000
      IVPNT(L) = IPNT
      GO TO 2800
 2700 L=-L
      M=IDVPNT(L)
```

```
      IF(M.NE.0) GO TO 3000
      IDVPNT(L)=IPNT
 2800 Z(IPNT-2)=1.E+200
      Z(IPNT-1) = -1.E+200
      IPNT = IPNT+N+2
      IF((IPNT+N).GT.6482) RETURN
 3000 CONTINUE
      IOP(KOPO) = KOP-KOPO
      KOP = KOP+1
      KC = KC+1
      DO 3300 I=2,8
      LABEL(I-1,KC) = A(I)
 3300 CONTINUE
      GO TO 2200
  100 FORMAT(8A10)
  101 FORMAT(14I5)
      END
```

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